First Copy

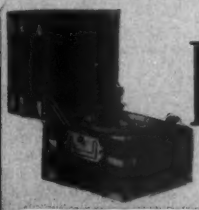
PUBLIC LIBRARY
JUL 23 1941
DETROIT

The AMERICAN HOROLOGIST

INCORPORATING

HOROLOGY

THE NATIONAL MAGAZINE
FOR ADVANCEMENT IN TIMEKEEPING



Horologists prefer . . .

SANDSTEEL
CONCAVE — CONVEX
QUALITY

CROSSCURVED MAINSPRINGS
FOR ALL MAKES OF WATCHES

ORDER
FROM YOUR
JOBBER

SPECIFY
SANDSTEEL

Made in U.S.A.

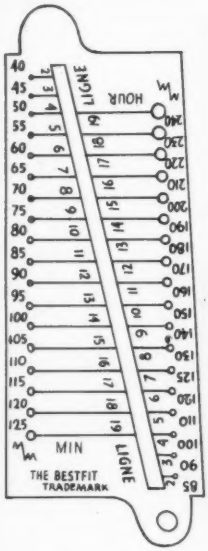
SANDSTEEL MAINSPRINGS
IMPROVE YOUR EFFICIENCY
AND REPUTATION

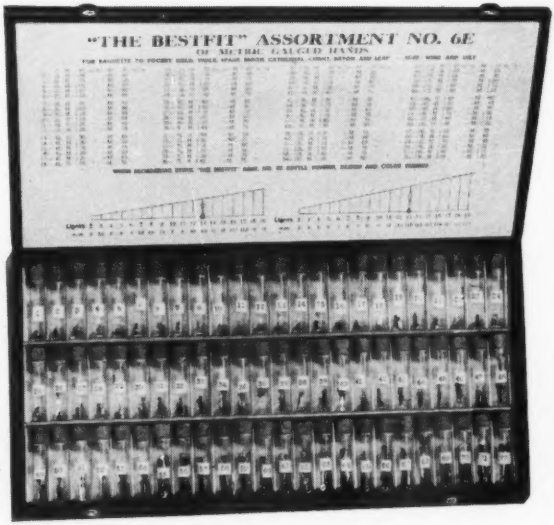
WATCH-MOTOR MAINSPRING CO., INC.
145 HUDSON STREET, NEW YORK, N. Y.
Write for Latest Catalog

EIGHTH YEAR OF PUBLICATION

Vol. 8 JULY, 1941 No. 7

The PROPER HAND *at Hand*
..everytime..all the time





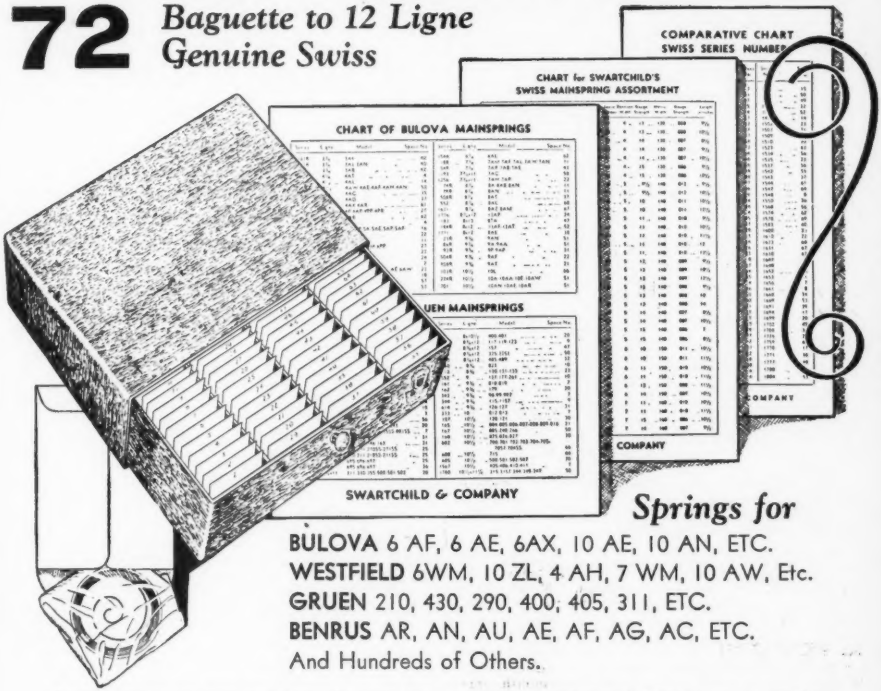
Now you can be sure of selecting the proper Hand for all Swiss Watches—with every hand in one complete assortment. The famous BESTFIT Gauge immediately directs you to the bottle holding the Hand you are looking for; FREE with THE BESTFIT ASSORTMENT No. 6E. Included are 12 dozen pairs of hour and minute Hands, 2 through 19 ligne. This is all the stock you require—and you reorder only those Hands you actually need. BESTFIT Metric Gauged Hands come in Blue, Gilt and Wine in the following shapes: Index, Moon, Cathedral, Cubist, Stick, Leaf, R.R. Index and Thin Stick.

SOLD THROUGH WHOLESALERS ONLY!

B. JADOW *INC., NEW YORK*
Sole Importers and Distributors
41-43 MAIDEN LANE

SWARTCHILD'S 1941
Mainspring Assortment

72 *Baguette to 12 Ligne Genuine Swiss*



Springs for

BULOVA 6 AF, 6 AE, 6AX, 10 AE, 10 AN, ETC.
WESTFIELD 6WM, 10 ZL, 4 AH, 7 WM, 10 AW, Etc.
GRUEN 210, 430, 290, 400, 405, 311, ETC.
BENRUS AR, AN, AU, AE, AF, AG, AC, ETC.
And Hundreds of Others.

Seventy-two of the very best sizes—the most important and serviceable numbers, carefully selected and ordered especially for Swartchild's Annual Swiss Mainspring Sale—a most comprehensive variety for men's and ladies' wrist watches from baguette to 12 ligne, including springs for the popular present-day models.

Comparative charts for BULOVA, WESTFIELD, BENRUS and GRUEN enable you to promptly select springs for the various models without the necessity of measuring the old spring—simply refer to the charts which show the space number of the mainspring you need.

Another of the charts included is a Swiss Series list with illustrations of setting bridges which provides for the quick selection of a mainspring for any of the hundreds of differently named Swiss watches which are identified by Swartchild's Series numbers. In addition to the above mentioned cross index charts, the usual chart of Dennison and Metric sizes is provided. Put up in a well-constructed 72-space mahogany colored leatherette cabinet, as illustrated.

Fine Swiss quality — reverse style — riveted tongue ends — all nicely finished and packed individually in oiled paper and separate envelope. Every mainspring is in keeping with Swartchild's high standard of merchandising, notwithstanding the fact that the price is exceptionally low.

Seventy-two Swiss bracelet size mainsprings for men's and ladies' wrist watches from baguette to 12 ligne sizes, including springs for the popular present - day models. Complete with charts and cabinet as described.

$6.95

No. 49302. Six dozen Swiss Mainspring Ass't as described...

DELIVERY NOTICE—We have been notified by our shipping agents in Switzerland that these special bargain mainsprings are on their way to us. Due to obvious conditions, however, we cannot guarantee our delivery date to you, but immediately upon our receipt of this shipment, your order will be filled. Because this supply is limited and no additional quantities can be obtained this season, we urge you to send us your order promptly.

SWARTCHILD & COMPANY

World's Largest Watchmakers' and Jewelers' Supply House

29 E. Madison St. CHICAGO | **31 West 47th Street NEW YORK** | **Santa Fe Bldg. DALLAS** | **Volunteer Life Bldg. ATLANTA** | **387 Washington St. BOSTON** | **Brisbane Building BUFFALO**

EIGHTH YEAR OF PUBLICATION

The AMERICAN HOROLOGIST

Incorporating HOROLOGY

Published Monthly

By Roberts Publishing Co., Denver, Colorado, in the interest of the Horological & Jewelry Industry.

To advance Education	To assist in Obtaining State Legislation	To Develope Standardization	To Encourage & Recognize Effort & Ability

Advertising and Editorial Offices: 3226 E. Colfax Ave., Denver, Colorado

London: Malcolm Gardner, 12 Earnshaw St., New Oxford St.

Volume VIII | **July, 1941** | **Number 7**

Official National Publication of the United Horological Association of America, Inc., and all its affiliates, who operate as a united body toward the advancement and upliftment of the Horological and Jewelry Industry.

PRICE

25c per copy, $2.00 per year in United States, $2.50 per year in all foreign countries. Members of U. H. A. A. receive the paper as part of their membership benefits.

ADVERTISING RATES ON REQUEST

Contributions and advertising material must be received not later than the 25th of the month preceding publication.

CHANGE OF ADDRESS

Change of address must be made prior to 5th of month to effect the forthcoming issue of the magazine. Both old and new addresses must be given.

OFFICERS AND PERSONNEL

Address all communications to THE AMERICAN HOROLOGIST, 3226 E. Colfax Ave., Denver, Colo.

Editor and Manager: Orville R. Hagans, Denver, Colo.

Circulation Manager: M. M. Hagans, Denver, Colo.

Associate Editors: Frank Foegler, Cincinnati, Ohio; Harold Sabro, Portland, Oregon; B. W. Heald, Milwaukee, Wis.

Technical Editors W. H. Samelius, Elgin, Ill.
Louis Levin, Los Angeles, Calif.
Samuel Levin, Los Angeles, Calif.

Assistants: Technical Board Members, National Association.

Clock Technical Editor: J. E. Coleman, Nashville, Tenn.

Staff Photographers: J. Perrine, Denver, Colo.; J. E. Coleman, Nashville, Tenn.

Eastern Advertising Manager: J. P. Sommer, 1524 Beaver Ave., N. S. Pittsburgh, Pa.

Nothing which appears in THE AMERICAN HOROLOGIST may be reprinted without special permission.

Copyright, 1941, by Orville R. Hagans.

TABLE OF CONTENTS

Odd But True 6

Do You Know, by W. H. Samelius 9

Development of the Hairspring and its Performance, by Walter J. Kleinlein 10

Tolerance in Rate, by Samuel Levin 17

U. H. A. of A. Scores a Hit ..... 18 & 19

U. H. A. of A. Plans for 1942 20

1941 Resolutions 22

Convention Pictures 24

Looking into the Future, by Harrison F. Babcock 28

An Analysis of the Lever Escapement, by Harold C. Kelly 31

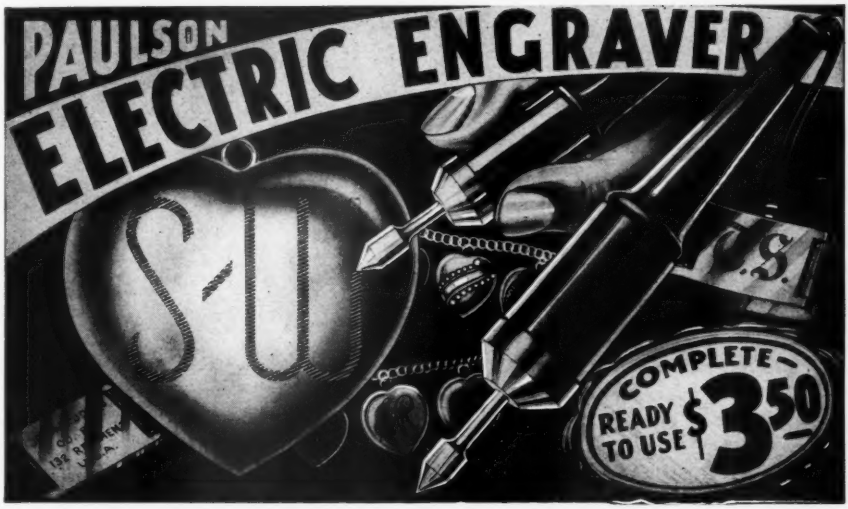
Association News 34

Aeronautical Instrument Service 38

Information Please, by W. H. Samelius 44

Trade News 46

State Conventions 48



Paulson Electric Engraver, simple and easy to use

110 Volt
60 Cycle

Engraving Initials
on Sterling Silver Sweetheart Charms greatly increases the sale.

All Silver Soldered.
No. 6148A. Assortment of 36 silver hearts on card display as shown to left. Each heart about one half inch in diameter. The average cost for heart is about 16c. You can sell them from 50c to 75c each.

For card of 36..... **$5.65**

Card of one doz.. **$1.95**

Brings Customers into Your Store

HENRY PAULSON
AND COMPANY
37 South Wabash Ave.
CHICAGO, ILL.

Use this handy order coupon

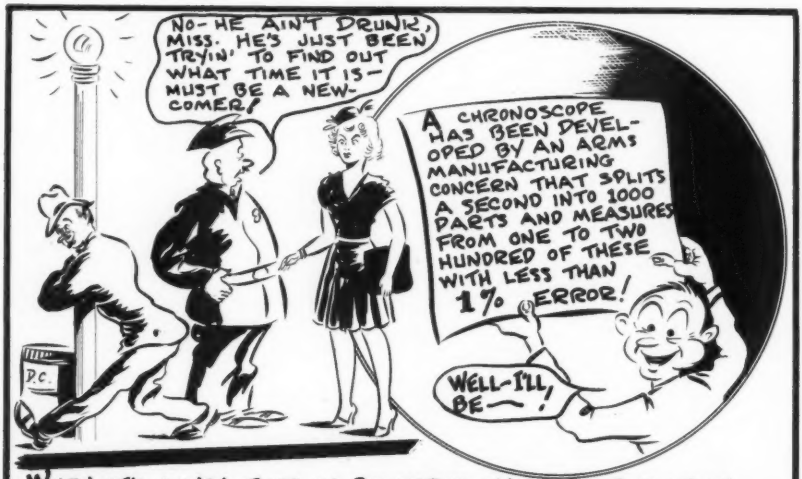
HENRY PAULSON & CO., 37 S. Wabash Ave. Chicago
please send:
- ☐ No. 11580 Paulson Electric Engraving Tool
- ☐ No. 6148 A, ass't of 36 silver hearts, $5.65
- ☐ One Dozen Silver Hearts, $1.95

Name .....
City .....
State .....

H. 7-41

ODD But TRUE

By Weil


NO-HE AIN'T DRUNK, MISS. HE'S JUST BEEN TRYIN' TO FIND OUT WHAT TIME IT IS— MUST BE A NEW-COMER!
A CHRONOSCOPE HAS BEEN DEVELOPED BY AN ARMS MANUFACTURING CONCERN THAT SPLITS A SECOND INTO 1000 PARTS AND MEASURES FROM ONE TO TWO HUNDRED OF THESE WITH LESS THAN 1% ERROR!
WELL-I'LL BE—!
P.C.

WHEN IT'S LUNCH TIME IN COLUMBUS-WHAT TIME IS IT IN STEUBENVILLE, OHIO? WELL, THAT DEPENDS. NONE OF STEUBENVILLE'S POPULATION OF 37,586 CAN BE ANY TOO SURE. THE MERCHANTS HAVE ADOPTED DAYLIGHT-SAVING TIME—WHILE THE RESIDENTIAL SECTION IS STICKING TO EASTERN STANDARD TIME. TO FURTHER COMPLICATE MATTERS—THE FACTORIES HAVE MOVED CLOCKS AHEAD ONE HOUR, BUT SCHOOLS, THEATERS AND SMALL STORES REFUSE TO TINKER WITH THE TIMEPIECES!

CLOCK-BANJO!

THIS UNUSUAL INSTRUMENT IS OWNED BY FRANK REIKART OF SWORMVILLE, N.Y. IT IS A BANJO MADE OUT OF A 90 YEAR OLD CLOCK!

2 COMPLETE STOCKS

TOOLS — WATCH MATERIAL — SUPPLIES

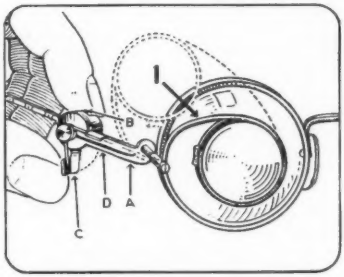
FOR THE HOROLOGIST AND JEWELER

LOS ANGELES **SAN FRANCISCO**

Behr's Spectacle Loupe

Universal Fitting right or left side

For Watchmakers, Jewelers, Engravers, Etc.

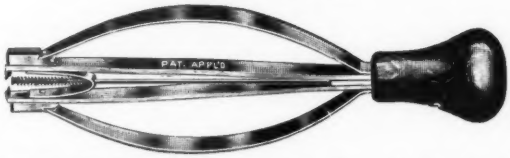


1-1½ inch Focus—Each....1.90

2 to 5 inch Focus—Each..1.70

Double Focus—Each 2.45

A New, Practical Tool That Every Watchmaker Should Possess



PRESTO Each $3.50

Hand and Cannon Pinion Remover

SELECTED CROSSGRAIN
BOXWOOD CIRCULAR LAP
SLIGHTLY BEVELED
CHARGED WITH No. 6
HELDMAN'S
SUPERIOR DIAMOND POWDER
UNEXCELLED FOR REMOVING
PITS FROM CAP JEWELS
EACH $3.50

HELDMAN'S
SUPERIOR DIAMOND POWDER

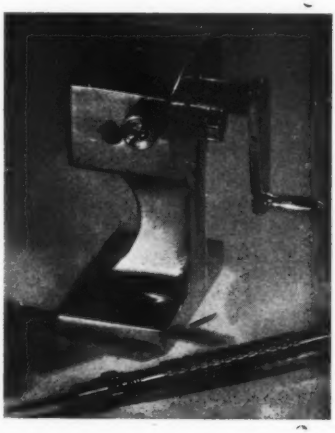
No. 2 Very coarse, Per ¼ Karat	1.80
No. 3 Medium coarse, Per ¼ Karat	1.80
No. 4 1st Cutting, Per ¼ Karat	2.20
No. 5 1st Polish, Per ¼ Karat	2.55
No. 6 Fine Polish, Per ¼ Karat	2.95
No. 7 Extra Fine Polish, Per ¼ Karat	3.30

E. W. REYNOLDS CO.

Phone VAndike 1231
Metropolitan Bldg., Los Angeles

Phone SUtter 4572
150 Post St., San Francisco

New . . .



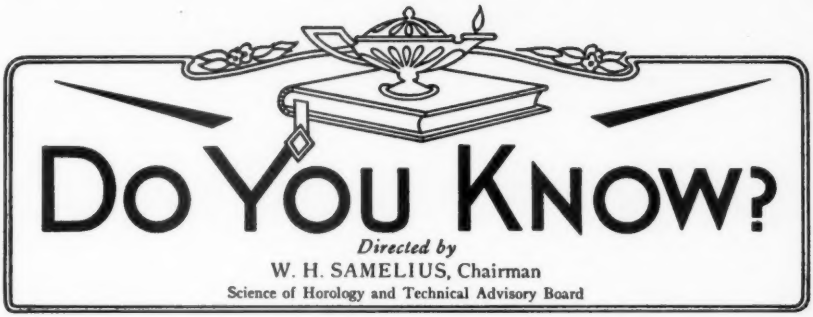
Screw driver sharpener and shaper. Adjustable to any size. Now it is a pleasure to work with properly sharpened and shaped screw driver. After a screw driver is once shaped on this tool it takes only few seconds to re-edge the blade. No need to stop your work, to look for something to work the screwdriver over. You hardly change position at your work.

Just a few twists of your wrist and you resume your work.

This tool is positively guaranteed to do the work, save your time, and more than anything else give you pleasure using a screw driver that is perfect.

PRICE $3.50

Order from your jobber. If your jobber for any reason cannot supply you with this tool, order direct from Houston Mfg. Co., 407 Stewart Bldg., Houston, Texas.



Directed by
W. H. SAMELIUS, Chairman
Science of Horology and Technical Advisory Board

George Graham of England invented the deadbeat escapement, receiving it's name from the fact that the locking faces of the pallet are ground concentric with the pallet pivot. When the escape tooth drops on the locking plane, the wheel is completely at rest.

Any timepiece not employing a pendlum is portable.

On some of our early watches the inner end of the mainspring was bent or shaped like a fish hook, a slot in the barrel arbor engaged the hook and by this means, holding the spring in order to wind the watch. Today we have a hook in the arbor and a hole in the end of the spring.

Many of our earliest watches had but one hand and required winding twice a day.

The first Elgin watch was completed April 1, 1867. It was an 18S key wind and key set model and sold for $117, uncased.

The roller jewel is the smallest piece in the watch, there are approximately 4,660,000 of these parts to a pound.

A straight line escapement is one where the balance, pallet and escape wheel centers are planted in a straight line.

A right angle escapement is one where the balance center is placed at right angles to the line from the escape wheel and pallet center.

The ordinary house clock is equipped with a recoil escapement.

Invar is used for pendulums because it is less affected by temperature changes than the regular steel or wooden pendulum.

The strength of mainspring the same thickness, same width and same length can vary in strength due to the quality of steel and the process of hardening and tempering.

The geometrical curves used for forming watch or clock wheel teeth is the epicycloidal curve. For Stem wind wheels, the involute curve and cycloidal curves are used in many instances.

The escape wheel teeth recoil slightly on all escapements except deadbeat, cylinder and duplex ecsapements.

Among the escapements used in late years are the lever escapement, chronometer, cylinder and duplex escapement. The oldest type of escapement is the verge, this style of escapement being used as late as 1840 by the English.

The escapement, by means of an escape wheel and pallet, converts circular motion of the escape wheel to vibratory motion of the lever which in turn converts oscillating motion to the balance.

The minute hand passes the hour hand eleven times during one revolution of the hour hand, or each 12 hours.

Development of the Hairspring and Its Performance in Temperature and Positions

Address at U. H. A. A. Convention
Duluth, Minnesota
By WALTER J. KLEINLEIN
Waltham, Mass.

Walter J. Kleinlein

History records that for the first 165 years of portable timekeeping, watches operated without a hairspring. It is also recorded that the first spring was a straight piece of elastic wire known as the "Balance Spring", invented by Robert Hooke of England, in the year 1665, in an attempt to better control the oscillations and lost motion of the balance wheel and verge escapement.

It has also been substantiated that selected hog bristles were used for the same purpose at about the same time.

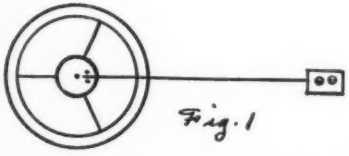


Fig. 1

The mechanics of the balance spring consisted of two pins about one-eighth inch apart near the center of the balance. The steel wire or bristle was about twice the length of the diameter of the balance wheel and was fixed firmly to the plate of the watch at one end. The free end of the spring passed between the two pins (as shown in Fig. 1.)

When the balance wheel was started in motion by the verge, the length of the arc was restrained by the elasticity of the spring engaged by one of the pins.

When the arc of the balance wheel was reversed through operation of the verge, the same thing occurred on the other side. The balance traveled until the arc was stopped by the elastic spring or bristle, then repeated the operation upon receiving the next verge impulse. Sometimes pins were fitted to the rim of the balance and the spring passed over the cock.

This invention was of no great practical value in reducing the large fractions of an hour per day variation, but the idea soon brought out the flat spiral spring by the Dutch scientist, Christian Huygens.

The invention of the Hairspring was claimed by both Hooke and Huygens and appears to have never been satisfactorily settled.

The first spiral hairsprings, about 1675, were hand-formed and contained only 1½ to 2 coils—(see Fig. 2.)

Fig. 2

They were staked to the balance wheel by means of a solid friction collet and the diameter of the springs was approximately ¾ of an inch. Hairsprings of verge escapement watches seldom exceeded 4 coils, the escapements, however, were made as late as the middle of the 19th century.

It was not until the cylinder escapement came into favor about 1725 that closely coiled hairsprings were used. The cylinder escapement made thin watches and lighter mechanism possible.

The more delicate balances and escapements required less hairspring power and more constant vibration.

Those who used the cylinder escapement in watches, therefore, found the fewer coils too strong and

rigid and soon learned that additional coils of substantial wire thickness and elasticity was a better way of arriving at the correct number of vibrations per hour than could be obtained with a very fine wire and fewer coils.

The hairsprings of cylinder escapement watches seldom exceeded 10 coils. It was not until after the detached lever escapement, invented by Mudge, an English horologist, in 1754, coming into more popular favor in Europe later in the 18th century that hairsprings with 13 or 14 coils, such as we now see, came into use.

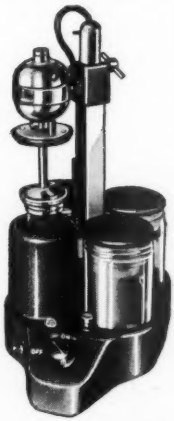
With the improvement in escapement and train mechanism, portable timekeeping became more accurate. Minutes variation per day were no longer looked upon without concern by those engaged in making the best timekeepers.

The balance and hairspring has ever since engaged the attention of scientists from other fields in an endeavor to solve some of the problems presented. Research brought out the fact clearly that a considerable part of the timekeeping error was due to variation caused by changes in temperature, particularly during such changes as occur from one season to another or in the marine service in different climates. Watches regulated to keep time in cold weather would run minutes slower in summer temperature and when regulated to the higher temperature would gain correspondingly in winter.

Investigation proved that the laws of expansion and contraction were responsible and that about 90 percent of the error was caused by the steel hairspring. In cold weather the metal

The new **L. & R.**

Master Cleaning Machine



To-days most popular Watch Cleaning Machines with more than 10,000 in use you cannot go wrong on an L. & R.

New revolutionary Reverse Switch.

Reverses rotating action, instantaneously, as desired, where needed.

Other new features.

- **Aligning Square Column**
- **Nickel Silver Shaft**
- **Monel Mesh Baskets**
- **Monel Lined Heavy Jar Tops**
- **Vitreous Heater Unit**
- **Pilot Light Heater Indicator**
- **Controlled Reversing Action**

Complete with Solutions

$49.50

The new L. & R. WATERLESS cleaning solution will never cause rust; dissolves in any rinse. Will neither float nor drop to the bottom. Gallon, $3.00, Quart, 85c.

FRIEDMAN-GESSLER CO.

220 W. 5th Street, Los Angeles, California

AN APOLOGY

The illustration used in our advertisement, this magazine June issue, was copyrighted by the C. & E. Marshall Co. of Chicago, not being known to us. However, we should not have used this illustration and wish the C. & E. Marshall Co. to accept our apology for having done so.

FRIEDMAN-GESSLER CO., Los Angeles, California

contracts, the spring becomes shorter and stronger, and the increased elasticity produces a gain in time. In warm weather the metal expands, the hairspring becomes longer and weaker producing a loss in elasticity with a losing rate in timekeeping.

Before the invention of the bimetallic compensation balance by Arnold and its improvement by Earnshaw about 1769, there was no recognized correction for the heat and cold variation of steel hairsprings.

In theory, Arnold's and Earnshaw's balances were the same. They differed, however, in the method of construction and in practical results. Arnold's idea consisted of soldering a strip of steel and brass together and curving them in circular form with the steel inside.

Earnshaw improved on this by turning rings of steel and brass and soldering the steel ring inside the brass. This proved to be best in actual practice because the rims when cut retained a more normal circular form.

This method of construction is still used wherever bimetallic compensation balances are made, and no better way has been found to equalize the temperature variation of steel hairsprings at the extremes of heat and cold.

From variation of minutes per day at the extremes of 40° and 90° Fahrenheit, the error can be reduced to zero. Tolerances of American manufacturers generally ranged from two seconds between the extremes for the best grades of Railroad and fine pocket watches to a tolerance of ten seconds for the three position grades.

Introduction of the overcoil by Breguet about 1820 increased the opportunities for a finer development of the hairspring but it was not until the latter part of the 19th century when, together with Phillips' isochronal theories, that attention was given to adjusting watches to very close tolerances in positions.

With increased attention to position adjusting and close final timing of fine watches, another phase of temperature variation entered the picture.

It was quite possible to obtain perfect compensation of the hairspring error at the two specified extremes of 40° and 90° Fahrenheit by shifting screws in the compensation balance wheel. It was however very seldom that this same perfection could at the same time be attained in normal room temperature of approximately 70°F. This error is known as the secondary or middle temperature error and it nearly always produces a gain of from two to four seconds from the rate shown at either extreme.

The error became very annoying to manufacturers of precision watches for either observatory rating or fine pocket performance. For example, a watch might be very closely adjusted to temperature, isochronism and positions, then final timed in the pocket position at room temperature to no variation over a period of four or five days. When placed in the pocket at the higher temperature, the watch would lose its proportion of the secondary error during the time so carried. When left in a cold place over night, the reaction was exactly the same, a loss from the normal room temperature rate.

It is principally for this reason that watchmakers get best results from railroad and other fine adjusted watches by regulating them from 2 to 4 seconds fast per day on the rack.

When Dr. Chas. Edw. Guillaume, the eminent Swiss scientist, began his successful experiments with nickel steel balances at about the turn of the present century, it was to control this secondary error. The balance which makes complete compensation now possible is known as the Guillaume Integral Balance. It is used on all watches obtaining highest ratings in Swiss observatories and is bimetallic compensating. The rims are cut about

1/8 of the circle from the arms and it is always used with highest grade steel hairsprings. This combination should not be confused with monometallic balances and self-compensating hairsprings used in general commercial production.

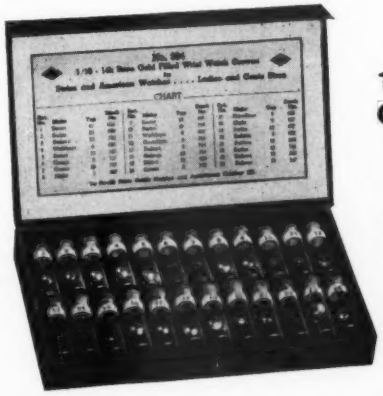
Dr. Guillaume's success in using the nickel steel alloy in balances led him to experiment with a similar alloy for hairsprings. His efforts resulted, about a quarter of a century ago, in the production of elinvar which was less sensitive to temperature change. Hairsprings made of this alloy were practically non-magnetic, rustproof, and reduced the primitive temperature error of steel springs by approximately 80 percent. Because of this large reduction in the temperature error, solid rim non-compensating balances replaced bimetallic balances.

Since those early experiments, several other kinds of self-compensating hairsprings have been developed, among them the Waltham Conel metal, and they are now used quite generally on both large and small watches.

With the increased use of electricity, the non-magnetic feature of self-compensating springs is very important and their continued improvement holds much of advantage to be desired both in general practice and in economy of production.

Terminal Alterations of the Hairspring

In adjusting railroad watches to close position tolerances, the terminal points of attachment of the properly hardened and tempered hairspring perform an important function. This refers to the relative point of attachment of the spring at the collet in comparison to the point of attachment at the stud. The points of attachment may contain either a complete coil or any fractional part of a coil depending upon the rate or model of the watch. Each fractional alteration in this relationship will change



Order From Your Material Jobber

ROSE
(PINK)
1/10-14 K GOLD FILLED CROWN ASSORTMENTS

This assortment contains twenty-four different Rose (Pink) 1/10-14K Gold Filled Crowns for Swiss and American Watches in both ladies' and gents' sizes.

No. 384
2 Dozen Different Crowns
Each $3.00

No. 384A
4 Doz. Crowns—2 in each Bottle
Each $5.00

THE NEWALL MFG. CO.
CHICAGO, ILLINOIS

the position rate of the watch an approximate number of seconds depending upon the extent and direction of the alteration.

It will be noted that I said—"the properly hardened and tempered hairspring"—This is very important because without the elastic force contained in a properly hardened and tempered spring, the rules applying to terminal alterations do not operate. This will be demonstrated in the explanation of terminal alterations on the blackboard.

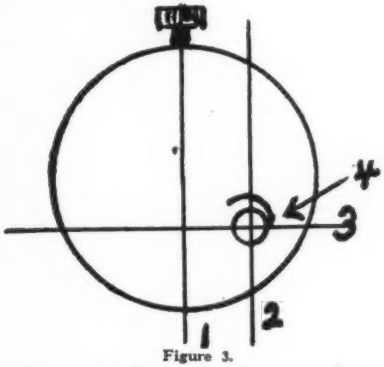


Figure 3.

Factory adjusters refer to terminal alterations as "cutting the spring". Railroad watches, such as the Waltham Vanguard, have the hairspring terminals pinned at a definite relation to each other when the springs are fitted to the balances. This relation consists of approximately even coils for open face watches and is called the "fast pendant up point".

The fast pendant up point means that the rate of the watch in the pendant up position is fast (normally 12 to 14 seconds) compared to the rate in the opposite or pendant down position. This point of attachment is best for fine watches and permits of a very close 5 position adjustment.

When the watch is in good mechanical order and the hairspring is pinned at the so called fast point, the pendant right and left positions can be expected to time very closely to each other. The pendant up position will also be quite close with the regulator pins properly adjusted. The greatest variation in the four vertical positions will consist of the slow rate in the pendant down position where it will have the least effect on the timekeeping of the watch. The horizontal rates generally come quite close when the regulator pins are nearly closed so there will be only slight vibration of the coil observed with a double glass and when the pivots are carefully polished.

Should the pendant up rate be too fast compared to the horizontal, the regulator pins should not be opened further for it is quite probable that the spring needs to be cut to a slower pendant up point. The way to find the fast pendant point of attachment of the hairspring for any model watch and the effect of "cutting the hairspring" is, as follows:

In the absence of a blue print, the fast pendant point of the hairspring may be located in the following manner.

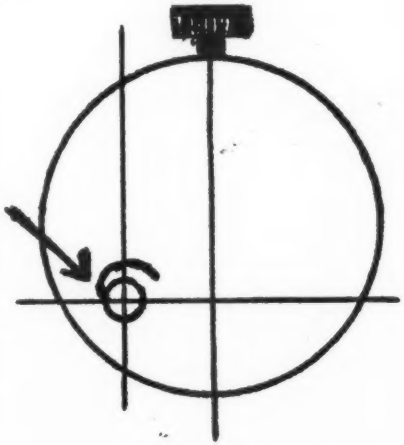


Figure 4.

Look at the train side of movement with pendant up. Draw an imaginary vertical line through the center (as shown in 1, Fig. 3,) Then draw a parallel line bisecting the balance jewel (as per 2,) and finally a horizontal line bisecting the jewel (as per 3.) The fast pendant point is on the horizontal line at right side of collet

(as shown by the arrow 4.) This is for spring developing to the left from the collet as most American springs do.

Foreign watches are nearly all built with the train developing in the opposite direction. The hairsprings develop to the right and the fast pendant up point is, therefore, on the left side of collet at the intersection of the horizontal line, (as shown by the arrow in Fig. 4.)

The stud point of attachment to the cock is not important in either case. It may be above or below the horizontal line and therefore, the spring may be over or under even coils. The important factor is that the coil must develop upward as it leaves the collet.

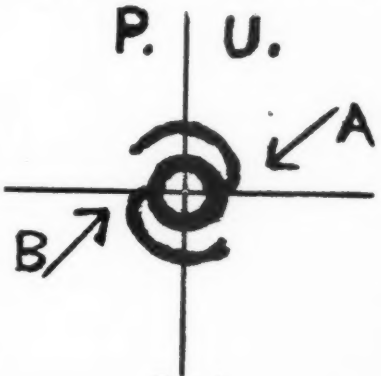
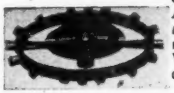


Figure 5.

Most watches answer to commercial tolerance with springs pinned at the fast pendant point, however, if the rate is too fast or slow, it is necessary for the adjuster to make an alteration. The procedure is to let out the spring at the collet if the pendant rate is slow compared to the horizontal, or to cut the spring to a slower point if the rate is too fast. This is done by breaking off the spring at the collet and repinning it a sixteenth or an eighth of the coil shorter. It will be necessary to reweight the balance or turn out the timing screws, if any, to correct the mean time and it will also be necessary to place the spring in beat.

SANDSTEEL
CONCAVE CONVEX
QUALITY
CROSSCURVED MAIN SPRINGS
Patented—Made in U.S.A. by
WATCH-MOTOR MAINSPRING CO., INC.
Supplied for All Makes of Watches by
AMERICAN MAINSPRING & DIAL SERVICE
42 W. 48th St. New York City
Write for Catalog No. 10, also Dial Refinishing Price Lists.

COSLEY JEWELRY COMPANY
Wholesale Dealers of
Jewelry, Tools and Jewelers' Supplies, Findings, etc.
301-302-303 University Building
Denver, Colorado

EXPERT HAIRSPRING VIBRATING

Of all Precision, Normal, Abnormal, Flat, Breguet and non-magnetic Hairsprings. 24 HOUR SERVICE. A trial order will convince you of our Quality Work.
UPTOWN HAIRSPRING SERVICE
10 W. 47th St. New York, N. Y.

Watch Material
SWISS & AMERICAN TOOLS, MOVEMENTS, CASES
LOWEST PRICES
PROMPT SERVICE
Write for Catalog H.
DEAN COMPANY
116 Nassau St. New York, N. Y.

The only difference then will be that the relative terminal points of attachment have been changed. The stud will be exactly where it was but the inner attachment will be higher on the collet. The alteration will cause a slower pendant up rate.

Figure 5 shows the fast and slow points of the spring on the position rate and its performance is, as follows.

The arrow "A" points to the extreme fast pendant point of attachment and just opposite at "B" will be found the extreme slow pendant point. Note that at "B" the coil develops downward as it leaves the collet.

D.U.	1+	4+
D.D.	2+	4+
P.U.	10+	6+
P.R.	14+	6+
P.L.	10+	2+
P.D.	6−	4−

Figure 6.

In between these arrows are many other pinning points. Any point of attachment from "A" to "B" will produce a proportionately slower pendant rate until the slowest point at "B" is reached and highly elastic springs are quite sensitive to such alterations.

Any further cutting of the coil from "B" to "A" will produce a faster pendant rate until the extreme fast point at "A" is again reached.

When a coil is cut to the first quarter above "A", the pendant rate not only becomes slower but pendant left becomes the fast vertical position rate of the spring because, in that position, the coil leaves the collet on the right side as it did pendant up before being cut.

Figure 6 is an example of a 6 position rate before and after "cutting the spring". The fast pendant up and pendant right rates were improved by 8 seconds through cutting the spring from the fast point to one-eighth coil short.

The above examples are based on the previously mentioned basis of elasticity due to properly hardened and tempered hairsprings. Springs that are originally soft or from which the elasticity has been lost through corrosion, rust or long use, will respond only slightly or not at all to the rules governing terminal alterations.

Soft springs will sag and cause all vertical rates to be slow compared to the horizontal regardless as to whether the metal is steel or an alloy. A fair estimate of the elastic quality of the spring may be obtained by the watchmaker through comparison with other springs before making alterations. Watchmakers who have not had experience in terminal alterations will find a great deal of advantage in doing high class work through practice of the alteration during spare time.

President J. P. Sommer right and Executive Secretary Hagans, informally talking about the public showings and wonderful attendance which proved to be far beyond their expectation as well as the exhibitors.

Tolerance in Rate

By SAMUEL LEVINE

A subscriber writes the following: I would like the following information about American 21 jewel, 6 position watches in good adjustment.

1. How many seconds daily variaare allowed in any position?

2. What are the allowable variations for temperature?

3. What are the allowable isochronism variations?

4. When tested on the electric machine, how wide a space is allowable between the 'tick' and the 'tock' lines?

The American watch factories do not, of course, publish their tolerances for their railroad grades of watches. Therefore, the best reply one can make to these questions is to refer the subscriber to the requirements of the Bureau of Standards for high grade watches submitted for testing and to the requirements of the Horological Institute of America for its Certified Watchmaker examination. It should be remembered, however, that only watches which are in excellent adjustment will pass these tests and that the average railroad grade of watch will usually fall short of coming within the prescribed tolerances.

In its Class A test for watches the Bureau of Standards demands a maximum variation of 10 seconds in 24 hours between any two positions and 5 seconds in 24 hours between the dial up and pendant up positions. The difference in rate per degree Centigrade from 5 degrees to 35 degrees should not exceed .20 seconds. The allowable isochronism error is 3 seconds.

The Horological Institutes examination specifies 15 seconds as the maximum variation between any two positions. Temperature and isochronal variations permissible are not stated.

If the watch is properly adjusted, the 'tick' and 'tock' lines will merge into one line on the record made by an electric timing machine of the WatchMaster or Paulson type. If the watch is to be adjusted as a precision timepiece one should not be satisfied until the two lines come within a sixteenth of an inch. For ordinary work a separation of about an eighth of an inch may be tolerated.

Featuring-

•

Full line of Watchmakers and Jewelers Tools

•

Unusual Jewelers Supply Co.
Room 406 Metropolitan Building
Los Angeles, Calif.
Phone Mutual 3681

NuVigor — Mainsprings For Swiss & American Watches

Jacoby-Bender Watch Bands

NEET — Watch Straps

Standard Unbreakable Watch Crystals

FIT-TITE — Fulton Fit-Tite Watch Glass

When you think of MAINSPRINGS You think of

SANDSTEEL
CONCAVE — CONVEX
QUALITY

CROSSCURVED MAIN SPRINGS

Their superior power and resilience naturally makes them the QUALITY LEADER.

Made in U. S. A. by
Watch-Motor Mainspring Co., Inc.
New York

Supplied for all makes of watches by

Fred Palm
220 W. Fifth Street
Los Angeles, California

UNITED HOROLOGICAL ASSN. OF AMERICA, SCORES A HIT

Photographic Proof of Success

U. H. A. A. CONVENTIONS SHALL EXCELL

The photos on these pages are views of the enormous crowds in Display rooms.

U. H. A. A. PLANS FOR 1942

Jewelery and Horological conventions have always drawn one type of people, those in the industry, which is necessary, but UHAA is taking a different angle. Besides the trade they invite the consuming public, the people who are truly interested in our products and service.

During UHAA recent convention in Duluth, Minnesota. The public was invited to be their guest from 2 P. M. to 10 P. M. on Monday, their official clocker a policeman registered over 6,000 people outside of delegates.

These people the consuming public were invited via of personal free invitations distributed by all jewelers, news papers, and radio announcements.

Members of the association conducted public educational lectures at various counters, explaining how to look for a proper repair establishment and the care of their watches, the net results was reflected in the Duluths Jewelers increase of repair work, a decided increase.

Incidentally the displayors experienced a buying convention with many recording heavy sales.

Next year this type of programme will be increased and perfected to a greater degree whereby displayors will profit more than in the past.

National Board of Trustees, reading left to right standing, Oscar Bookin, Iowa, R. C. Schenk, Minnesota, S. G. Brolin, Chicago, E. Bogage, Massachusetts, Harry Flotermersch, Ohio, Herman Gruninger, Michigan, Mac B. Guretzke, Wisconsin, Ray Gable, Missouri, Herman Pedrick, Pennsylvania, Max Phillips, Idaho, J. L. Phelps, Oregon.

Seventh Annual National Convention Banquet, Duluth, Minnesota, June 22-23-24, 1941

NATIONAL OFFICERS U. H. A. A.

The Seventh National Convention ended with a truly successful record. The association is now settling down to its job in a business like manner, with a more careful selection of commiteemen who want to do a given job.

Programmes are being reformed to meet with demands, the Executive Board was reduced to seven in order to curtail expenses and permit the Board of Trustees to function. National By-Laws were re-arranged and cleared up. The association as a whole has been streamlined. 1942 will witness one of the most active organizations in the industry as well as the largest according to plans and reports.

DO YOU BELONG TO YOUR GUILD, STATE AND NATIONAL ORGANIZATION? Information may be had from National Headquarters, Denver.

National Executive Board, reading left to right standing, J. E. Obmann, Missouri, B. W. Heald, Wisconsin, Duke Barnes, Michigan, and J. DeVogel, New York Executive Comm. Seated, Orville R. Hagans, Executive Secretary-Treasurer, Denver, J. P. Sommer, President, Pennsylvania, Col. Wm. H. Bright, Vice President, Massachusetts.

Lubrication Troubles?

Does the oil you are using dry up? . . . does it gum? . . . does it spread? You get rid of all of these troubles when you use

FULCRUM OIL

All material jobbers sell Fulcrum Oil and the makers stand back of their guarantee.

FULCRUM OIL COMPANY FRANKLIN, PA.

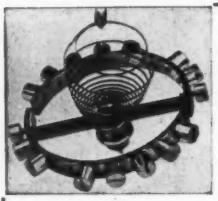
FREE ★
STEEL CABINET
with assortment order for any popular make of watch (or your own selection) in **GENUINE MICROSCOPIC FANCY GLASS WATCH CRYSTALS**

396 cry., 1 ea. no. ass't	$41.25
732 cry., 1 ea. no. ass't	76.25
960 cry., 1 ea. no. ass't	100.00
1248 cry., 1 ea. no. ass't	130.00
1536 cry., 1 ea. no. ass't	160.00

Regular and Military **$1.25** per doz.

Ask your wholesaler or write direct, mentioning your wholesaler's name, for free catalog, gauge, and samples. Dept. H. Wholesalers write for worthwhile proposition in your territory.

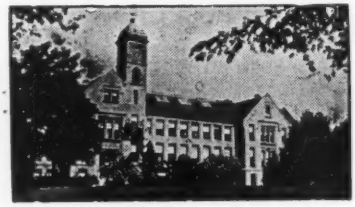
FEDERAL WATCH CRYSTAL CO.
129 Fulton St. New York City



HAIRSPRINGS
Close Timing
Send balance bridge, balance, stud and collet.

SPECIAL ATTENTION TO MAIL ORDERS
Stanley Wenckus
Room 420 315 W. 5th Street
Phone Michigan 9001 Los Angeles, Calif.

"The Pathway to Success"



WATCHWORK
JEWELRY
STONE SETTING
ENGRAVING

Bradley Polytechnic Institute
School of Horology
DEPT. B PEORIA, ILL.
Established 1886

Resolutions 1941 United Horological Association

Resolution No. 1

Where-as:—By the prompt action and extreme courage of the American Horologist in incorporating the Magazine, "Horology", into our National affairs; it is hereby Resolved:—That this Association in convention assembled does pledge to the American Horologist incorporating Horology and the advertisers therein our complete and greater support in its endeavors for the benefit of our Association and all watchmakers.

Resolution No. 2

Where-as:—The demand for rental of the small sized Plaque is so very small and the cost greater than the demand warrants; Be it resolved:—That the United Horological Association of America, discontinue the issuance of the small size plaque to it's members after supply is exhausted and limit the use of the plaque to the Standard size only.

Resolution No. 3

Where-as:—The cost of the Standard Plaque used by members for display purposes, being in excess of two dollars ($2.00) and Where-as:—The United Horological Association of America has been in the past issuing these plaques to members for less than actual cost, it is therefore Resolved:—That the contract charge of the Plaques for the first year be two dollars ($2.00) instead of the $1.50 as heretofore charged and the renewal charge of one dollar ($1.00) remain the same.

Resolution No. 5

Realizing that the sale and service of watches and clocks is becoming more of a science with each new model coming out, It is here-by Resolved:—That this convention be recorded as favoring the sale of watches and clocks, by the manufacturers and jobbers to Jewelers and Watchmakers only, thereby eliminating the Drug, Hardware, General Merchandizing or Dry Goods, etc. stores from

the resale of watches and clocks to the buying public.

Resolution No. 7

Resolved:—That the United Horological Association continue sending American Horologist to its members, who are in selective service of the United States Armed Forces, and suspend payment of dues until that member returns, within reason.

Resolution No. 8

Resolved:—That due to the increased business activities in the months of June and December, the National Convention shall not be held in either of these months in the future.

Resolution No. 9

Resolved:—That this Association go on record as being in complete sympathy with the West Side Retail Jewelers Association in its campaign against the sale of watch straps and watch bands by certain drug, chain, and department stores.

Further Resolved:—That this Association will give its aid and assistance to the campaign now being waged by the West Side Retail Jewelers Association of Chicago, Illinois.

Watch Master Free

For over a year there has been a contest in our association with its grand prize a new WATCH MASTER through the courtesy and cooperation of Charley Fetters and his company AMERICAN TIME PRODUCTS, Inc.

This instrument was won by the Cincinnati Watchmakers Guild.

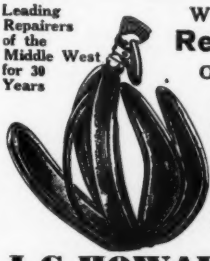
Interest was so high during the convention among those who had not had the opportunity to participate in this grand prize, because last minute entrants were refused, that Mr. Fetter allowed the association to conduct a drawing allowing a $50.00 credit to the winner. We extend our sincere thanks to The American Time Products for their aid and to the members and associations who contributed towards our Liquidation and educational funds.

No. 308

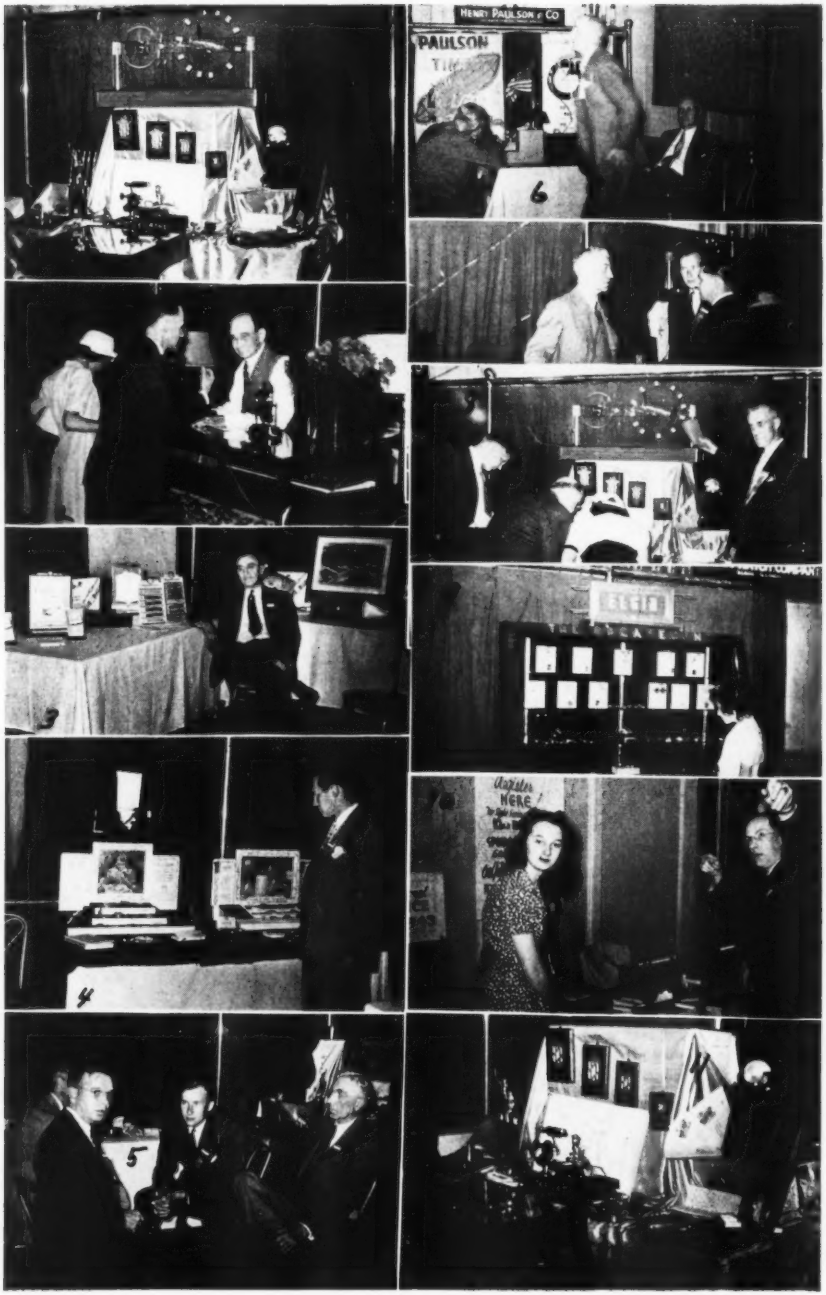
ARISTO
Military Watches
A fine line of waterproofs to fill every demand.
No. 307 Waterproof 7 jewel steel back anti-magnetic radium dial. List $17.00
No. 308 Waterproof with Sweep second hand, illustrated. 7 J. Steel Back. Radium. List $19.50
No. 317 Waterproof, Shockproof, Sweep Second, All Steel Case, 17 Jewels. Radium. List $31.50
No. 417 Waterproof Self-winding, Shockproof, 9 K Rose Gold Case, Steel Back. List $65.00
Will send samples on approval.
ARISTO IMPORT CO., INC.
Dept. H-7, 630 Fifth Ave., Radio City, New York

BOWMAN
TECHNICAL SCHOOL
Offers Up-to-Date Courses for Success

FOR WATCHMAKERS ENGRAVERS AND JEWELERS
Regular Courses for students without previous experience.
SPECIAL COURSES to improve the ability of experienced men.
Write today for fine (free) book "YOUR FUTURE AND OUR SCHOOL" which tells all about what B. T. S. can do for your greater future success.
Bowman Technical School
LANCASTER, PENNSYLVANIA
John J. Bowman, Director

Leading Repairers of the Middle West for 30 Years

WATCH CASE
Refinishing
Our Specialty
Movement fitting of every description. We carry a stock of bezels for most makes of Wrist Watches. Send us a trial order and be convinced.
J. C. HOWARD & Co.
Mailers Bldg., Rm. 919, 5 S. Wabash Ave., Chicago, Ill.

WM. S. McCAW COMPANY
GENUINE WATCH MATERIALS & SUPPLIES
Room 215 320 Superior St., Toledo, Ohio


HENRY PAULSON & CO
PAULSON
6
4
5

J

INFORMATION FOR GROUP OF PICTURES

1—View of U. H. A. of A. booth and part of Ford Display

2—Lady unknown at the counter, Schenk, State Trustee, and Dad Tucker.

3—Harry Ruthert, Hamilton

4—George Gruen at Gruen Booth

5—Colonel Bright, Robert Moore of Waltham, W. Kleinlein of Waltham.

6—Henry Palson booth, Mr. Paulson in motion

7—Walter Kleinlein, Robert Moore

8—National Association U. H. A. of A. booth and Ford Displaly. Mr. W. W. Luce, President of Minnesota, pointing to plastic model.

9—Miss Garon, Detroit, Michigan, at the Elgin Booth

10—At the registration desk, President J. P. Somner and registration girl.

11—Another view of U. H. A. of A. and Ford Display booth.

12—(With his back turned) Rudy Hendrickson, Hamilton Watch Company, young Lady unknown, next one Herbert Schmidt.

13—Extreme right, Walter Luck

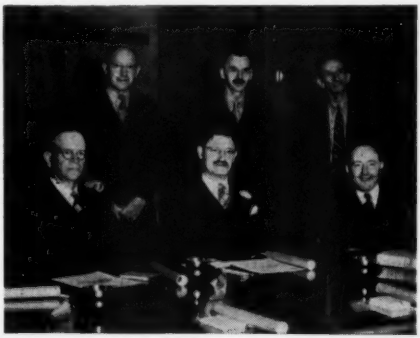
14—Mr. Moore of Waltham Watch Company, Mrs. W. Luce and Mrs. H. Schmidt

15—View of Duluth, Minnesota

Pictures by Harry Garon of Julius Garon Company of Duluth, Minnesota, popular material house of Duluth.

Oregon Board of Examiners Appointed

The Governor appointed the newly created Board of Examiners in Watchmaking June 12th. This our third State Board has started their work with a determination to have the best in America.



Standing left to right, F. A. Dielschneider, McMinnville, Harold Sabro, Portland, Secretary, Hans F. Hays, Portland.

Seated, O. L. Skeie, Eugene, Jack H. Peare, La Grande, President, and Charles A. Sprague, Governor of Oregon.

BRAND **A/S** BRAND

Guaranteed spring rings and swivels in 14 Karat gold, sterling silver, gold filled and acid test. All sizes. Mail orders filled promptly, or "ORDER THRU YOUR JOBBER".

ALPERT SUPPLY CO.

12 John St., New York City

FRANK KAUFFMANN

1485 Third Ave., New York, N. Y.

IMPORTER

of world-famous hand-carved

CUCKOO CLOCKS

and Parts; also Movements for Grandfather Clocks

Ask for Latest Price List

YOUR TIME *is wit... mone...*

SAVE TI...

OTHER WATCH-CRAFT FEATURES

1. **ACCURATELY SIZED---CORRECTLY SHAPED--tailormade to fit the case.**
2. **FINEST QUALITY CLEAR SPARKING GLASS.**
3. **PROPERLY DOMED---allows plenty of hand space.**
4. **SNAP IN PERFECTLY.**
5. **PERFECTLY FINISHED EDGES.**
6. **HAS TOUGHNESS AND ELASTICITY.**

The Crystal Tht Wil... Most Exactin Wat...

IN 12 DRAWER ...
Add-a-Unit CABI...

Beautiful Mahogany ...ish—st... other Marco steel ...inets— have lock-stop, canno fall ou... yet easily removed if ...esired.

WRITE FOR ...

CHICAGO (2)

DALLAS
DETROIT
LOS ANGELES
NEW ORLEANS
MILWAUKEE
MINNEAPOLIS
COLUMBUS
PITTSBURGH
HOUSTON
KANSAS CITY
OKLAHOMA CITY

Marco

C. & E. MARSH...

A GREATER VALUE — A...

Largest and Foremost Supply H...

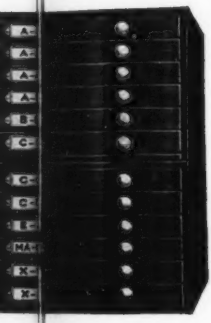
with money

TIME With WATCH-CRAFT

REG. U.S. PATENT OFFICE - No. 348436

Fancy Glass Crystal

STOCK CONTROL SYSTEM



That Will Suit the Exacting Watchmaker

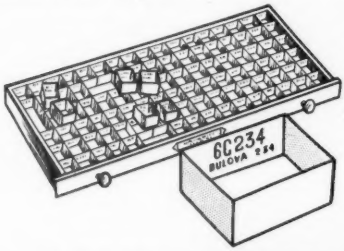
RAWER STEEL
Unit CABINET

any finish—stack with all steel cabinets—all drawers cannot fall out or drop,—ed if desired.

A FANCY CRYSTAL SERVICE OFFERED BY NO OTHER COMPANY—

TIME has always been an element of cost. Handling stock that is not systematically arranged and kept up is time's worst waster. Our Watch-Craft Fancy Crystal SERVICE keeps your stock in perfect order by keeping inactive crystals from cluttering up your cabinets.

Our Stock Control System keeps you constantly informed regarding discontinued sizes and numbers that are becoming inactive. When crystals for new model watches are issued you are advised immediately—you are likewise informed when the popularity of a crystal falls below a certain level, so that it can be sold out and discontinued before it represents a loss to you.



With our stock control system you can always find the exact crystal needed instantly because it is always in its right place and proper order. Each size of crystal has its own movable compartment with the size of the crystal and case manufacturers name printed on it.

When you add new numbers the compartments are easily placed in their proper rotation. Whole rows can be moved at a time. Only a moment of your time is required.

BUY WATCH-CRAFT AND GET A LIFETIME OF FREE SERVICE!

REG. U.S. PATENT OFFICE - No. 348436

FOR DETAILS

Marco

RSHALL CO.

E — A GREATER SERVICE

ost Spply House in The World!

DATE_____

C. & E. MARSHALL CO.
BOX 7737, CHICAGO

Send me all details regarding WATCH-CRAFT Fancy Glass Crystals.

Name_____

Address_____

City_____

"Looking Into The Future"

By HARRISON F. BABCOCK

Address given before the U. H. A. of A. Convention, Duluth, June 23, 1941

Again, I have the pleasure of extending greetings to you at your Annual Convention.

The meeting this year is held in the face of a grave National emergency and with an outlook which is uncertain. My subject is "Looking into the Future" but let us begin by reviewing the past. This is the seventh annual convention of the U. H. A. of A. and at the time of its inception, the Nation faced another emergency, domestic rather than international. All of us here can recall that 1933 saw this country in a complete state of economic collapse, our banks had been closed, people were discouraged as to the future and the country was as near to a state of disintegration as any one could remember.

It was under those conditions that a group of men saw the need of such an organization as this in the watch industry; they had the courage of their convictions and, by looking into the future with determination and confidence in their ability, formed and developed this Association to its present successful position. The road has not been easy, it was a pioneering effort and many obstacles and disappointments had to be overcome but they have brought the organization safely through to its present state of success. It was indeed worthwhile and all credit is due to those who have carried it through these difficult times.

We are now facing another emergency, greater than any that has confronted us before. Not only our national security, but our economic and religious life, in fact our whole civilization as we have known it for the past 150 years is definitely threatened. We will be called upon to make personal sacrifices and temporarily abandon some of the liberties we have always known but whatever these sacrifices may be, we will gladly make them as patriotic and loyal citizens of this Nation.

These are self-evident facts but there is another fact, equally self-evident. This country will be carried through this emergency successfully and peace and tranquility will eventually return in a not too distant future, we hope. With this will be a period of reconstruction during which, many of the old problems that confronted this organization and the industry, will arise again and perhaps, many new ones so it is well to take stock at this time to see how best we can meet those problems which will be inevitable.

During the seven years existence of this organization and with the experience gained in analyzing and combating the problems of the watchmaker, it has been found that certain needs have developed that are outstanding and upon which rests the future of the industry. We may put them down as follows:

(1) There must be legal control of ethical and technical standards.

(2) There must be greater educational development in the industry.

(3) There must be a standardization and development of instruction available to the watchmaker.

(4) There must be recognition of ability and encouragement of effort to bring out new ideas, keep the industry abreast of the times and prevent stagnation.

(5) There must be greater united effort through organization.

These are fundamental and will continue to be, either in times of peace or crisis.

State legislation for the licensing of watchmakers which establishes legal control of technical and ethical standards, is the starting point and foundation for the advancement of the profession. Three states, representing approximately 10% of the na-

tion's watchmakers, now have licensing laws. This is a very encouraging start, having been accomplished within five years; these laws have been administered successfully by Boards and have been advantageous to the industry and public.

We may be inclined to look only at the successful enactment of these laws but fail to appreciate the work that is required to secure their passage. There are many problems that arise of a political nature, having little to do with the Bill itself, or with the profession. One of the facts we have to face is, that, numerically, watchmakers in any State, represent a very small percentage of the population, consequently, to make an impression on the political leaders and achieve results, a high degree of unified effort through strong organization, is required. Problems arise that are wholly unrelated to the industry, such as animosities and jealousies among political leaders and parties who would sacrifice the Bill, regardless of its merits, for their own political ends. This is not only true of our legislation, but of any that may be presented.

My own experience with a Chamber of Commerce official who had charge of legislative activities of that body, may be of interest. In a discussion with him, he said, "Why license watchmakers? I am a lawyer but there are a lot of dishonest lawyers, licensing doesn't stop them." I replied, "Then according to your statement, your law should be repealed." "Oh, no!" he said, "it should be made more drastic." In other words, he admitted the value of licensing for his own profession but could not see the necessity for any other. Even the newspapers refer to our Bill as "pressure legislation for the benefit of a small group." The point is, those reactions are inevitable and can only be overcome by the united effort of everyone. It is a sig-

"It's About Time"
by
MAJOR CHAMBERLAIN

The latest book on the market, over 550 pages and illustrations in excess of 350.

For years the trade has looked forward to such a book by the late Major Chamberlain, is now available.

Book review in our last months paper
Price $7.50

Orders Should Be Sent to

The
AMERICAN HOROLOGIST
incorporating HOROLOGY
3226 East Colfax Avenue
Denver, Colorado

FEURER BROS.
228 E. 45th St., N.Y.C.

Just completed a most modern Watch Crown factory in New York City. Have been making the finest crowns in Geneva (Switzerland) for over 20 Years.
Samples—Prices on request

LANDAW BROTHERS
Watch Material & Jewelers' Supplies
406 Clark Building, Pittsburgh, Pa.

Clockmaker To The Trade
- Wheels and pinions cut on order.
- Antique clocks restored.
- Estimates and inquiries solicited.

STANLEY PROKOP
Rushville, Nebraska

nificant fact, that in every State where licensing has been obtained, there is a strong State organization affiliated with this National body. The road to securing legislation is not easy, there will be many disappointments and discouragements but it is well worth the effort and is the one hope for the future advancement of the watchmaker. It is the responsibility of all, not a few, to work to that end.

Legislation, itself, is a beginning. These laws can only be successful if they result in better service to the public, unless they do, they will fail; all organizations and individuals must recognize that fact. It is the responsibility of the watchmaker to perfect and advance himself through education in order that he may give this increased service which is so vital to the success of these laws.

The U. H. A. of A. has been a leader in the educational field and has recently added a group educational plan, now in operation, which is outstanding and the most extensive ever offered to the industry. The recent merger of THE AMERICAN HOROLOGIST and HOROLOGY, with the combined technical staffs of both magazines, will make available to the profession, educational facilities that are far superior and broader in scope than any that have been offered before or likely to be in the next few years. These opportunities will be useless unless the individual has a sincere desire to improve himself and appreciates the importance of doing so. Organizations can furnish the leadership but the desire for advancement must come from the watchmaker.

To carry on this educational work, there must be standards of instruction set up and minimum requirements. The U. H. A. of A. has pioneered in this field and has a School Curriculum Committee now functioning. For years past, the industry has been afflicted with promotional schemes to instruct the watchmaker through correspondence courses, etc. which have made it difficult, not only for legitimate schools, but for the young man to get started on the right path, who honestly wanted to learn. The establishment of these minimum requirements and the standardization of curriculums, will go a long way towards making available the proper instruction in the future.

In order to create interest and a desire to advance, there must be some recognition of ability and encouragement of effort to create new ideas and prevent stagnation. This can be done through competitive exhibits of workmanship and awarding certificates and medals each year at the annual convention.

These are the fundamentals upon which the advancement of the watchmaker depends; they hold true in times of prosperity or depression—crisis or tranquility and must be recognized by the industry if it is to progress. These have always been the objectives of the U. H. A. of A. and much has been done by them along these lines but there is still much more to be done which brings us to the fifth requirement.

For many years, there was a lack of organization leadership and coordinated activity which brought about many abuses and practices; these lowered the standard of workmanship and ethical conduct to the point where the confidence of the public was lost to a considerable extent. Previous to 1930, there were organizations formed, sincere enough, but local in character, in that their program was not broad enough to reach the problems of the watchmaker from a national standpoint and, in some cases, did not fully grasp them.

It was only after the U. H. A. of A. was formed on the basis of Local, State and National organizations, that any definite progress was made. This type of organization gives the strength of united action that is nec-

essary to go forward; it is true the problems of the industry are largely local and the effectiveness of the National body depends upon the strength of the local Guilds but the State and National organizations each have their respective fields in which to work. For instance, the question of legislation—it is perfectly apparent the support of a strong State and National body is essential if it is to be enacted. The point is, that if any progress is to be made in the coming years, it can only be by united effort through organization leadership.

We must have confidence in our organizations, our leadership and, above all, ourselves.

An Analysis of The Lever Escapement

By HAROLD C. KELLY
Member National Technical Board

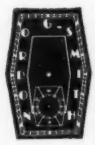
(Continued from last month)

The Fork and Roller Action

Unlocking and Impulse Actions—The relation between the fork and roller jewel as a mechanical action may be divided into two distinct and separate functions, namely: (1) the unlocking of the pallets and (2) the impulse to the balance. One action is the reverse of the other. The unlocking action takes place as a result of power derived from the balance and spring while the impulse to the balance receives its energy from the force delivered to the escape wheel by means of the main spring and the train. In the unlocking action, a short lever (roller jewel radius) acts on a longer one (the lever fork). A short roller jewel radius must be associated with a long lever which involves a large angle of contact as shown by the angle ABC in Figure 1. On the other hand a long roller jewel radius must be associated with a short lever which results in a small angle of contact as shown by the angle ABC in Figure 2. In other words, the shorter the roller jewel radius the larger is the angle of contact, and the smaller the angle of contact the longer is the roller jewel radius.

A 4 to 1 Roller Action—In Figure 1 the relation of the roller jewel to the fork slot is 4 to 1, that is, the lever moves 10 degrees and the roller jewel remains in contact with the fork slot for a space of 40 degrees. The action of unlocking begins quite some distance from the line of centers because of the short roller jewel radius. However a short roller jewel radius results in a much safer action and an easier unlocking of the pallets.

A 3 to 1 Roller Action—In Figure 2 the relation of the roller jewel to the fork slot is 3 to 1. Although the unlocking action is more difficult, the impulse to the balance is more energetic when it does occur. The 30-degree contact of the roller jewel with



Mail Orders Receive Prompt Attention

DIALS REFINISHED CRYSTALS FITTED

Our clean, sharp prints and up-to-date methods of duplicating any finish, distinguish our work from the average.
We invite your comparison of our workmanship and service. Modernize your stock watches with the latest finishes and designs
SEND IN YOUR DIALS AND CRYSTALS TOGETHER

MILLER DIAL & NAME PLATE CO.

524 Metropolitan Bldg., 315 W. 5th St., Los Angeles, Calif MI-0928
Manufacturers of Etched Name Plates, Watch, Clock and Instrument Dials. Radium Application

the fork slot is in accord with the theory that the lever should be as highly detached as possible for finer results in timing.

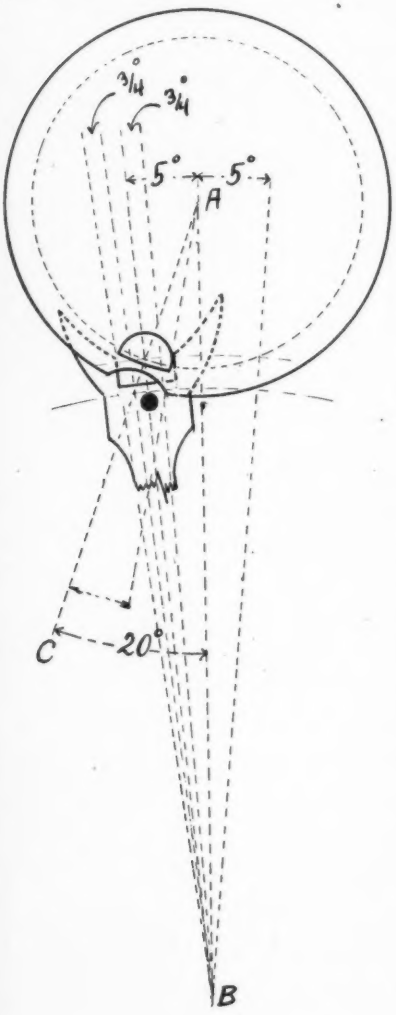


Figure 1

The more delicate safety action of a long roller jewel radius is not a problem in high grade watches for in such work we naturally expect a mechanical action that is more exact in its function. It follows, therefore, that a long roller jewel radius which involves a small angle of contact is one of the important factors to be considered in fine escapement design. Of course in the cheaper work it is always practical.

The Width of the Roller Jewel

A Wide Roller Jewel—The wide roller jewel results in a particularly satisfactory action of unlocking by taking place near the line of centers. However, the impulse to the balance is not so favorable. A wide roller jewel is inseparable from a long roller jewel radius for such a principle of design results in a very delicate action. A wide roller jewel makes the safety action much less delicate.

A Narrow Roller Jewel—A wide roller jewel, if associated with a short roller jewel radius, has the unfavorable condition of an impulse to the balance too far from the line of centers and the "uphill" circular path of the roller jewel along the side of the fork slot during the impulse to the balance results in considerable friction. Also on account of the greater angle at which the roller jewel stands to the slot when the impulse takes place, the drop of the fork against the jewel will amount to more than its shake in the slot, if measured when standing on the line of centers. Thus a narrow roller jewel is better adapted for a short roller jewel radius, and should always be associated with a single roller escapement.

Single and Double Roller Escapement

Single Roller Escapement—In the single roller escapement it is required that the roller table be as small as possible to preserve the safety action. Furthermore friction between the guard pin and the circumference of the roller table would be considerably increased on a table roller that is larger than necessary. It is difficult to reduce the angular motion of the lever to anything less than 10 degrees, and any relation of the fork to the roller jewel less than a $3\frac{1}{2}$ to 1

proportion is not practical.

Double Roller Escapement — We have learned that in order to favor the impulse to the balance we require a long roller jewel radius, and for the safety action a short radius. This is the reason for the passing of the single roller escapement in favor of the double roller type, for in the latter type we have two rollers, one for each action.

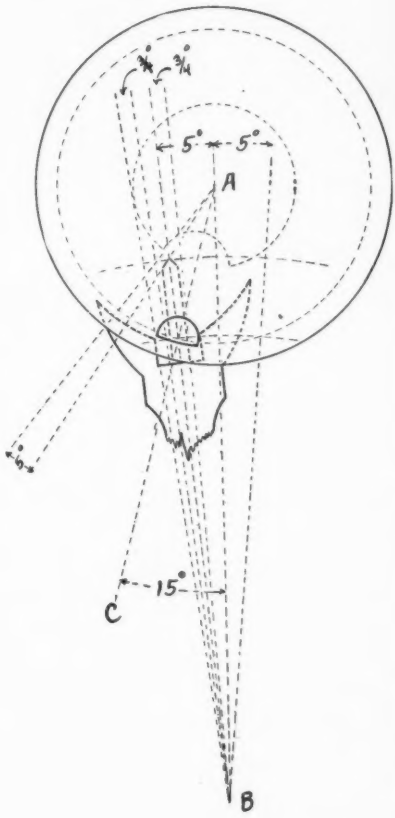


Figure 2

The size of the safety roller is of no great importance. For the sake of soundness in action it should not be less than one-half the diameter of the circle of impulse. The smaller the safety roller the sooner will the crescent approach the guard finger; and

Twice As Much for Your Money!

Majestic

Unbreakable Watch Crystals

EQUAL TO ANY ON THE MARKET **37½¢** WILL NOT SHRINK OR DISCOLOR

Corresponding number of other brands on each envelope. Easy to stock. Simply order from numbers of your present system.

MAJESTIC, FANCY CRYSTALS 37½c doz.

MAJESTIC Round Lentille CRYSTALS 50c doz.

Send for free samples

ALMO SALES CO. 723 7th AVENUE NEW YORK CITY

MODERN

WATCHMAKING

Learn Watchmaking

"The Better Way"; Save Time

Complete Courses in

—JEWELRY REPAIRING—

—ENGRAVING—

Start Any Time—Moderate Tuition

Write

K. C. School of Watchmaking

113 East 31st Street

Kansas City, Mo.

Gustave Van Erp, Director

WATCH CASES

REFINISHED LIKE NEW

Repaired, Polished, Gold or Rhodium Plated. Factory made fancy Bezels & Watch Glasses. Watch Repairing & Jewelry Manufactured. Prompt Service.

Expert Workmanship.

CALIFORNIA WATCH CASE CO.

150 Post St. San Francisco, Calif.

likewise, the longer the roller jewel radius the later will the roller jewel enter the fork slot. It follows, therefore, that the greater the difference between the respective radii of the roller jewel and the safety roller, the longer must be the horns of the fork. The width of the roller jewel also plays a part in the length of the horns for with any increase in the width of the jewel, the horns may be made proportionately shorter.

The Crescent

The circular notch in the roller is called the "crescent" and should be wide and deep enough so that it will be impossible for the guard finger to touch any part of it. If made too wide, longer horns on the fork would be required to preserve the safety action.

The width of the crescent in the double roller escapement is greater than in the single roller type for the reason that the guard finger, due to its increased length, has a larger space to cover for its safety action, or stating the function in another way; the velocity of the guard finger has increased whereas the velocity of the safety roller has decreased.

The Horological Association of Virginia

Recently held its state convention and the following officers were elected:

President—W. H. Tinsley, Roanoke, Virginia.

First vice-president—C. R. Knowles, Richmond.

Second vice-president—E. B. Setzler.

Secretary—Lorene M. Tinsley, Roanoke.

Treasurer—Theron O. Sowers of Norfolk.

The next state convention will be held in Petersburg, Virginia in May, 1942, with the Richmond Guild acting as host.

Lorene M. Tinsley, Secy.

Worcester County Guild No. 2 of Horological Association of Massachusetts

Col. Wm. H. Bright of Boston, national vice-president of the Horological Association, addressed the Worcester County Guild at a dinner meeting in the Hotel Aurora June 2. Col. Bright discussed the convention to be held at Duluth, Minnesota, June 22, 23, and 24.

Col. Bright and J. Edward Bogage, who is chairman of the national trustees, will attend the convention together.

It was decided that a state-wide picnic at the Yellow Barn, Northboro, August 17 would be held, with Paul C. Tasse as chairman. The next regular meeting will be held July 7.

J. Edward Bogage, Secy.

Tampa Watchmakers Association

At the recent meeting of the Tampa Watchmakers Association, May 26, drawings were shown of twelve different escapements, used at various times in watches, each being explained.

Movements from the collection of L. D. Stallcup, Secretary of the Tampa Association, were used to further show the various types of escapements used in the past.

The Tampa Guild is showing great interest in their work.

Incomparable Watch Case Repairing
OUR WORK COSTS NO MORE THAN ORDINARY WORK
BECKER-HECKMAN CO.
79 E. Madison St. CHICAGO, ILL.

Martin Gluck and Son
SUPPLY SPECIALISTS TO THE TRADE
Clark Building Pittsburgh, Pa.

Hampden Guild No. 5 of Springfield, Massachusetts

At the regular meeting, May 13, installation of officers was made, as follows: President, Alfred J. Frappier; Vice-President, Ed. M. Russell; Secretary, Lester N. Knowlton; Treasurer, G. L. Grimes.

Executive Committee, Ide I. Dearing, W. Tatro, E. Richardson, J. Kearney, and R. Hirchfield.

The installation was followed by a turkey dinner and entertainment, which was enjoyed by about 30 guild members and friends.

Activity is growing. Our second annual "steak roast and outing" at Frappier Camp on North Pond at Congamond Lake in Southwich, Massachusetts, on Route 10 is all set for July 20, 1941, rain or shine, at which time it is hoped we can organize another neighbor guild at Greenfield, Massachusetts.

Come if you can, bring your friends. Children free. We'll be seeing you.

The Publicity Committee.

Shreveport Watchmakers Organize

On May 29, fourteen Shreveport watchmakers were the guests of Mr. E. Powdrill, of Swartchild & Company at a dinner. Discussions were then held, and a decision was made to create a watchmakers' organization and elect permanent officers at their next meeting on June 12th.

Horological Society of New York

Held its last meeting of the season, June 3. The speaker of the meeting was Col. Wm. H. Bright, Vice-President of the U. H. A. of A., who addressed the group in behalf of the National Organization and received a tremendous ovation.

Officers installed for the ensuing year are: Andrew Parks, president; W. H. Bruhwiler, vice-president; J. L. Gruener, recording secretary; Henry B. Fried, corresponding secretary; Frank Knol, treasurer; Trustees: C. K. Johns and J. Keneske. Librarian and Assistant Librarian, Mr. N. Frey and B. Goldstein.

The next meeting will be September 2, 1941.

NYE'S

WATCH & CLOCK OIL

Established 1844

Nye's Superior Watch and Clock Oil is 100% American Product. The first quality pure porpoise jaw oil is scientifically refined in our own plant, New Bedford, Mass.

The satisfactory timekeeping qualities of any watch—American or imported—is safeguarded when Nye's Oil is used.

Wm. F. NYE, Inc.,
New Bedford, Mass.

The Minnesota Jewelers' Picnic

Sponsored by the Northwestern and Southwestern Minnesota Watchmakers Guild is to be held on Sunday, July 20th, on the shores of beautiful Lake Minnewaska at Glenwood, Minnesota.

—PLAN NOW TO ATTEND—

Invitations are extended to all retail and wholesale jewelers of Minnesota to attend this annual affair. Bring the family and enjoy a real Sunday's outing! Come prepared to play golf or kittenball, to fish, to swim or boating!

You are requested to bring your own picnic lunch!

FREE!

Coffee — Ice Cream — Refreshments

If you do not wish to bring your own picnic lunch, eats will be available on the grounds at reasonable prices.

During the afternoon and evening the Central Minnesota Band Festival with its 20 bands will present a Musical program.

BRING MA AND THE KIDS!

Do not forget the time and place!

City Park on Lake Minnewaska at Glenwood, Minnesota on Sunday, July 20th, starting at 12 noon.

Will be seeing you,

J. N. Jackson,
Picnic Chairman.

South Eastern Minnesota Jewelers Guild

Elected temporary officers for the formation of a Southeastern Watchmakers Guild, during a meeting of the district held in Austin, Minnesota, with National Executive Secretary, Hagans, as the principal speaker.

The officers elected are: Carl F. Kottke, president, Owatonna, Minnesota; W. D. Amundson, vice-president, Northfield, Minnesota; and G. M. Stiles, secretary-treasurer, Wells, Minnesota.

Capitol City Horological Guild

At our dinner-meeting of June 11th we were privileged to have Mr. Orville R. Hagans as the speaker. He talked to us about the educational program now being offered by the U. H. A. of A., and various other things of interest to our group.

We had about 27 members and visitors present. The watchmakers from Oskaloosa and Ottumwa who were here helped to make the meeting a success.

Ray Wiley, Sec'y.

A Correction

In the May issue of Horology the advance notice of Major Chamberlain's book "It's About Time" stated that the Major's wife, Mrs. Margaret Chamberlain, was a descendant of the famous English horologist George Graham. Mrs. Chamberlain calls the editor's attention to the fact that this is not correct and that the foreign publication which orginally published the statement is in error.

Horological Guild of Lackawanna County

This guild was organized on June 10, under the personal direction of Mr. Herman Pedrick and Mr. Franks of Philadelphia, Pennsylvania.

Temporary officers elected are: Walter C. Stoeckel, president; Louis J. Jones, of Scranton, Pennsylvania, secretary.

Grand Island-Hastings Horological Guild

At the meeting of June 22nd, new officers were elected.

Corey W. Chase of Holdrege, Nebraska, President. Paul Powell of Grand Island, Nebraska, Vice-President. Tom Crisman of Hastings, Nebraska, Secretary-Treasurer.

This Guild is preparing a program to increase not only their district, but the entire state.

Cincinnati Guild

Conducted its annual picnic June 1st at Gehrum's Acres, with a splendid turnout.

The regular monthly meeting was held June 6th. Legislative committee report and Educational program consumed entire evening.

Meetings of July and August dispensed with.

Elmer G. Fisher.

Fitting Hands Simplified

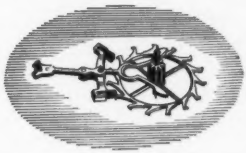
Truly revolutionary have been the changes in the watch hand industry effected by B. Jadow, Inc. The hand assortments sold by this company through wholesalers, make the task of replacing a Swiss hand as simple as that of repairing a standard American model.

All "The Bestfit" hand assortments are completely metricly gauged. Each assortment is accompanied, without charge, with a hand gauge which measures the length of the hand being looked for, as well as the hour and minute wheel socket sizes. The chart, also part of each assortment, immediately indicates the bottle holding the proper hand from these dimensions. For example, a 10 length hand, 1.40 hole for the hour hand is found in bottle No. 53. It is equally simple to determine the bottle holding the proper hand by the model number when it is known.

"The Bestfit" watch hands are all made to be fitted without a broach, each hand coming with 6 hole sizes, .02 of a millimeter apart. "The Bestfit" assortment, number 6E contains 12 dozen pairs of hour and minute hands for Swiss watches from 2 through 19 ligne. The economy feature of it being necessary only to reorder those hands that are actually required is featured by B. Jadow, Inc. Hands for any of these assortments may be ordered from tool and material jobbers throughout the United States and Canada.

OPPORTUNITY

—For Men Over 17
To Learn Watchmaking



Excellent salaries. Chance to own your own business. Steady Employment.

Are you ambitious? Would you like to enter the highly-paid watchmaking profession? A limited number of openings still remain at the Elgin Watchmakers College. Sponsored by the Elgin National Watch Company, this world-famous institution has developed hundreds of today's leading jewelers and watch experts. Here you get regular shop work and instruction under Elgin's master craftsmen. If you are over 17 and interested in this real opportunity, write today. Modest tuition. Address, Dept. E-34.

ELGIN WATCHMAKERS COLLEGE - Elgin, Ill.

QUALITY SERVICE
Since 1926
DIAL REFINISHING
CRYSTAL FITTING

IN STEP with TIME
And the WATCHMAKERS
Of AMERICA
Who Give Their Customers
Finest Quality & Service

KIRK-RICH DIAL CORP.

LOS ANGELES SAN FRANCISCO SEATTLE CHICAGO OAKLAND DALLAS DETROIT PITTSBURGH

Lathes-Slide Rests New-Used
Dunmore Motors New-Used
Crocker Gravers-Sharpeners
American-Swiss Watch Materials
R. P. (DICK) GALLIEN
220 West 5th St. Los Angeles

AERONAUTICAL INSTRUMENT SERVICE

Aircraft Instruments

EDITOR'S NOTE—Aeronautical Instrument Service is a subject untouched by publications in the Horological field, or in fact by any publication. In September, 1938, THE AMERICAN HOROLOGIST inaugurated such an educational service via prepared illustrated lectures to be used by U. H. A. A. organizations for the purpose of broadening our members' scope of knowledge in this field, which offered additional remuneration to those far-sighted enough to avail themselves of such knowledge.

ARTICLE No. 22

(Continued from June Issue)

Course-and-distance computer and protractor.—Having found by means of the drift meter and a stop watch the values of drift and ground speed, the navigator has at hand sufficient information for navigational purposes, but must perform a calculation before the pilot can apply it directly to the steering of the aircraft. The navigator must find the actual compass course in order to hold his track. To assist in this operation there are available two devices of importance: Namely, the protractor and the course-and-distance computer.

Protractor.—The protractor is a transparent card with a circular scale marked in degrees and with a silk thread attached to the center. It is laid on the map with the center on the point of departure, the 0-180° line parallel with the meridian, and the zero mark toward the north of the map. The thread is drawn taut and placed on the point of destination. The intersection of the thread on the circular scale gives the true bearing of the destination from the point of departure.

The course-and-distance computer.—This instrument makes possible the solution of all the problems relating to courses by a mechanical operation and eliminates all plotting. It consists of two disks and two arms pivoted at a common center. (See fig. 68.) The larger disk has a circular scale marked both in degrees and in points of the compass. The smaller disk is ruled with two diameters (one of which is marked with an arrow) at right angles to each other and with a set of equally spaced lines parallel to each diameter. The radius of this disk represents 120 miles and a side of each of the squares 10 miles. Each arm is graduated in miles to the same scale as the rulings on the disk and carries a slide index. Two sample problems best explain the operation of this computer:

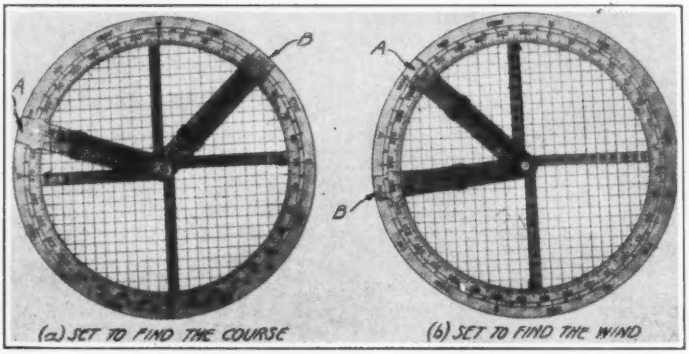


Figure 68 Course and Distance Computer

Given a wind of 40 miles per hour

northwest and an air speed of 60 miles per hour, find the course of the aircraft where the bearing of the destination is west.

Set the index of arm **B** at 40 and, to represent the wind, turn the arm until it is at **NE** on the circular scale. (See fig. 68 (a).)

Turn the disk until the arrow is at **W.** This is the **course to be made good** (actual course).

Set the index of arm **A** to represent the air speed. Then rotate **A** until a line between its index and that of **B** is parallel to the arrow, using the red lines that are parallel to the arrow as a guide. The reading of **A** on the circular scale gives the bearing of the aircraft's course.

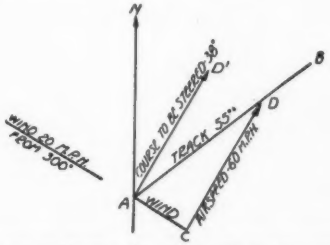


Figure 69 Setting the course, allowing for wind

Figure 68 (a) shows that we have a triangle of velocities similar to that of Figure 69. If the position of the **B** index is called **B**, that of the **A** index **A**, and the center of the disk **O**, then **BO** represents the wind in direction and magnitude; **OA** represents the aircraft's air speed in direction and magnitude; and **BA** is the ground speed along the track. The value of the ground speed can be found by counting the squares between **B** and **A**.

Given an air speed of 90 miles per hour on a course of 300° and a ground speed of 65 miles per hour along a course of 250°, find the wind.

Set the arm **A** at 300° on the circular scale and its index at 90.

Set the arm **B** at 250° and its index at 65.

Turn the disk until the arrow is parallel to the line between the in-

AMERICAN SCHOOL OF AIRCRAFT INSTRUMENTS

OLDEST and LARGEST INSTRUMENT SCHOOL

offers you

Finest, Most Complete Instrument Training

To make the most of the splendid opportunities for watchmakers in aircraft instrument work you need the LONG-established, ALREADY-proven training of this STRICTLY instrument school. The outstanding success of our many graduates—including a large number of watchmakers—in winning choice starting positions, advancing more quickly, and achieving responsible posts earlier, is a matter of record. Technicians trained by this school are employed by the major airlines, leading aircraft builders, and instrument manufacturers . . . and in Civil Service at Army and Navy aircraft maintenance depots. ALL divisions of aviation are now requesting our graduates even more urgently—in fact, beyond our training capacity for months ahead.

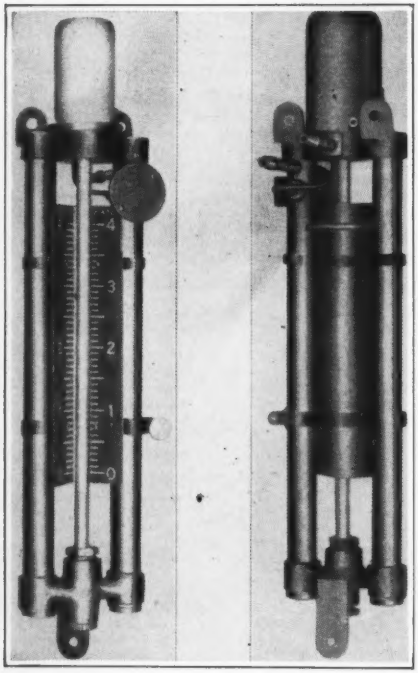
4 COMPLETE SHOPS

. . . NOT a general aviation school with only one instrument shop and only one training program. Highest possible government approval (as CAA-approved instrument repair station), most complete actual maintenance and testing equipment, personal instruction by largest staff of instructors in any instrument school (all CAA approved), and training embraces the Sperry gyroscopic instruments, including automatic pilot. Our 6 months training allowed as your COMPLETE substitution for the 2 years actual instrument experience ordinarily required for Civil Service posts. Similar recognition in all other divisions of aircraft instrument work. For complete details, send coupon.

AMERICAN SCHOOL OF AIRCRAFT INSTRUMENTS
3903 San Fernando Road, Dept. AH-7
Glendale (Los Angeles County), Calif.

Please send your catalogue and other information on opportunities for watchmakers in aircraft instrument work.

Name.....
Age.....
Address.....
City.....
State.....



Front View, Cap Off Rear View, Cap On
Figure 70—Liquid Manometer

dexes. Then the arrow represents the direction of the wind. As the wind always blows across the course toward the track, its direction is 349°. **AB** represents the magnitude of the wind, which is 65 miles per hour. (See fig. 68 (b).)

General rules for operation.—From the solutions of the above problems the following rules are suggested:

Use arm **A** to represent the course and air speed of the aircraft.

Use arm **B**, where possible, to represent the track and ground speed.

Always visualize the situation and connect a mental picture with the lines on the instrument, giving special care to directions.

Remember that the ground speed is the geometrical sum of the air speed and wind, as explained in the first problem.

Balloon and airship manometers.—Manometers are used on balloons and airships for measuring the pressure of the air in the ballonet and of the gas in the bag. These pressures vary with changes of atmospheric pressure and superheat. If the pressure is sufficiently great from either cause, the air escapes through the automatic valves in the ballonet. If the air ballonet were empty, the gas would valve out of the bag. In case the valve sticks, the bag may burst because of the excessive pressure. When flying at high speed it is necessary to have the pressure sufficient so that the bag will not be flabby at the nose. The manometer is simply a gauge to measure pressures varying from 0 to 3 or 4 inches of water. The pressure measured is the pressure in the bag or ballonet which is in excess of the atmospheric pressure.

Liquid manometer.—General.—The liquid manometer is merely a form of **U**-shaped tube filled with a nonfreezing colored solution (colored kerosene) and graduated in inches of water. Figure 70 shows the most recent type of liquid manometer, in which are incorporated the following novel features:

The scale can be moved to compensate for head of gas.

The bulb on the upper end of the glass tube prevents spilling under excessive pressure.

A static tube connection is provided to insure atmospheric pressure on one side of the liquid column. A static tube is mounted outside the car and connected to the manometer by rubber tubing. This feature eliminates the error which would be caused by the velocity of the air outside a closed car.

Installation and operation.

The liquid manometer is mounted on the instrument board in plain view of the pilot. The static tube should be rigidly mounted outside and several feet from the car, pointing forward, and should be connected to the manometer by one-eighth-inch rubber tub-

WATCHMAKERS and REPAIRMEN . . .

AVIATION Calls You

to a Prosperous Career as INSTRUMENT TECHNICIAN

(Above) A sectional view of Spartan's modern Instrument Technician Department.

The vital need for additional instrument men to fill the many good-pay positions in the rapidly growing aviation industry opens up greater opportunities for watchmakers and repairmen than ever before existed! Now is the time for you to cash in on your experience . . . to qualify yourself for a **real career** that pays big dividends now and which offers a prosperous future.

SPARTAN offers you

Superior Training and Newest Equipment

A new Instrument Technician Department with $25,000 worth of modern equipment has been established at SPARTAN for the special purpose of training Instrument Technicians for the aviation industry. Here at SPARTAN you have the latest type instruments to gain actual experience . . . and expert personalized instruction for thorough, practical training.

You already have a head start. Your past experience should make you perfectly suited for this precision work. Come to SPARTAN and get the superior training for positions with airlines, instrument manufacturers, aircraft plants, etc.—important positions in the fascinating aviation industry which offers a permanent, prosperous future!

Mail the coupon now for complete information.

SPARTAN

SCHOOL OF AERONAUTICS

Get The Facts

DIVISION OF SPARTAN AIRCRAFT COMPANY

Mail This Coupon

SPARTAN SCHOOL OF AERONAUTICS, Captain Maxwell W. Balfour, Director
Dept. AH-61, Tulsa, Oklahoma.

Please send me complete information concerning the Spartan Instrument Technician Course of training.

Name..... Address.....

City..... State.....

ing, the joints being shellacked and wired. The pressure tubing should be connected to the lower part of the bag, using care with the joints.

The operation of the manometer is as follows:

Fill the manometer to the mark of the glass tube by turning the valve to **Air,** removing the filler cap, and dropping in colored kerosene with a medicine dropper. An excess of liquid can be removed by opening the valve at the bottom of the manometer.

Replace the filler cap, turn the valve to **On**, and so adjust the scale that the zero point lies below the surface of the liquid an amount equivalent to the difference in head due to the height of gas in the bag and the same height of air.

See that the static tube and pressure connections are tight.

Mechanical manometer.—General.—This type is similar to other sensitive-pressure gauges such as those used for air-speed indicators. The mechanism of the present service instrument is shown in Figure 71. A flat colon-leather diaphragm with an aluminum center is used. The motion of this diaphragm, which is caused by pressure, is opposed by a leaf spring and transmitted by a simple multiplying mechanism to the pointer. The pointer travels along a curved vertical dial.

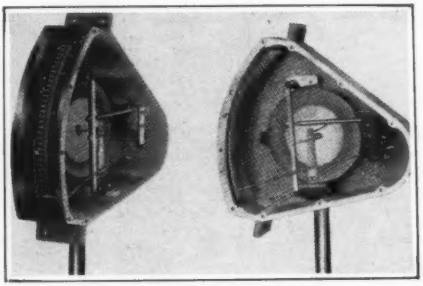


Figure 71 Mechanical Manometer

Installation. — The instrument is mounted in plain view of the pilot. In this type of instrument, the atmospheric pressure is communicated to one side of the diaphragm by an opening in the case, while the bag or ballonet pressure is communicated to the other side of the diaphragm by a tube connected to the bottom of the bag. A valve is usually installed in the line to the bag and ballonet. The tubing connections should be fastened as described above.

Set For Life

AS AN
AIRCRAFT
INSTRUMENT
• TECHNICIAN

Those who have an aptitude for precision instrument work will find unlimited opportunities and high pay in Aircraft Instruments.

Civil Service, Airlines, Airplane and Instrument manufacturers need instrument technicians to install, calibrate, repair, rebuild and design aircraft instruments. Air travel and navigation depends upon these instruments for safe schedule flying.

IN 6 MONTHS YOU CAN BECOME A SPECIALIST IN AIRCRAFT INSTRUMENTS

Chicago School of Aircraft Instruments offers two complete courses, based on the actual requirements of Civil Service, airlines and manufacturers. The day course is completed in six months—the night course in 18 months. The United States Civil Service Commission has recognized our six months course to be the equivalent of two years actual experience—and are accepting our qualified graduates as full-fledged Junior Aircraft Instrument Mechanics. Your experience as a watchmaker will prove invaluable. Both day and night classes are being formed now. Send coupon for complete details and fully illustrated catalog

CHICAGO SCHOOL
of
Aircraft Instruments

Dept. A.H.—6 Municipal Airport, Chicago, Ill.

Please send me your latest catalog and full details of your aircraft instrument courses.

NAME .....

ADDRESS .....

CITY..... STATE.....

Early American Clock Dials

The duplication, repair or refinishing our specialty. Estimates cheerfully given.

J. E. COLEMAN

50 Arcade Bldg. Nashville, Tenn.

National Workmanship Competition Awards

This annual event stimulates better workmanship and a desire to excell. Much material was presented this year, with the following results, only the most outstanding were considered.

FIRST PRIZE
Going Plastic Escapement Model
3 ft. in length
by
Orville R. Hagans & Paul Davidson
Denver, Colorado

FIRST PRIZE
Metal Working Model Clock
Unusual Design
by
Stanley Prokop
Rushville, Nebraska

SECOND PRIZE
Metal Working Model
Elgin Student, name next month

TOOLS

FIRST PRIZE
Wheel Cutter & Miller
by
Jes I. Hansen, Denver, Colo.

SECOND PRIZE
Truing Caliper & Small Bench Micrometer
C. A. Bryan
Hastings, Nebraska

HONORABLE MENTION
DRAWINGS
Chronometer Escapement
by
Hermann Gruhinger
Detroit, Michigan

Judges: John De Vogel, New York,
Emanuel Seibel, Connecticut,
Joseph E. Obmann, Missouri.

Pennsylvania Loses a Valuable Member

Mr. A. J. Healey of Homestead, Pennsylvania passed away June 23, 1941.

The state of Pennsylvania will miss this man, with his years of experience.

7-Jewel Watches

Priced For Mass Appeal

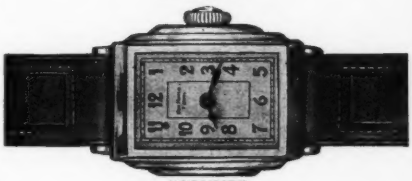
"BEK" heavily plated yellow gold cases with curved stainless backs—smart metal dials with etched numerals. 7-jewel temperature-compensated movements.

RETAIL
$6.50
TO
$7.50

"DUCHESS"

"DUKE"

"WALES"

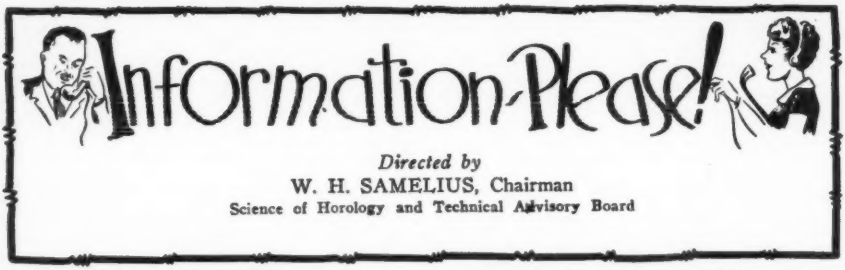


"COUNT"

Your Jobber Can Supply You

Watch Division
THE NEW HAVEN CLOCK CO.,
NEW HAVEN, CONN.

NEW HAVEN
Timepieces



Directed by
W. H. SAMELIUS, Chairman
Science of Horology and Technical Advisory Board

Information Please:

S. R.—Can you give me some reasons for mainspring breakage?

Answer:—There can be many reasons for mainspring breakage. It may be the spring was tempered, leaving it on the hard side. All mainspring manufacturers aim to harden and temper springs to a degree where they will not set, yield full pulling power and to the point where it will not break. Much breakage can be avoided in the handling of the spring and fitting it in the barrel. One evil is putting the spring in barrel by hand. This often kinks the spring, causing a fracture. The hook in the barrel may be too long, deforming the spring, causing a kink or fracture, where it will eventually break. We find the hook in the barrel arbor too long, causing kink as the spring is wound about the arbor; another reason for breakage.

If you are using a mainspring winder with long hook, you may do the same damage with a mainspring winder as if the barrel hook was too long. Rust spots on the surface of the spring will also cause breakage. If the edge of the spring is not properly rounded, the outside edge of the spring becomes stretched more than the inside edge. If there should be any irregularities or tool marks, they are liable to be the cause of fracture and finally break.

When replacing spring, it should be first dipped in naptha to remove the protective coating, carefully wiped dry with a linen cloth and while wiping the spring, care must be used not to stretch the spring straight, rather, follow the natural curve of the spring when drying same. See that the hook in barrel, the hook in the arbor are of proper length and also see that hook in mainspring winder is of proper length.

Carefully wind spring into winder, see that mainspring is in proper position when inserting in the barrel so the hole in the spring will engage the hook in barrel. Lubricate the spring with a heavy watch oil and do not fail to lubricate the first and second center coils of the spring as often the breakage of a spring can be attributed to the first two or three coils being dry, causing a binding action and when slippage occurs, there will be a sudden shock. Should there be any rust marks or fine line across the surface of the spring, or kinks in the spring, breakage often occurs.

MR. AF:—Would like to know what case hardening means and if watch parts are case hardened?

Answer:—Watch material is made from carbon steel, heated to a cherry red and quenched in water. This leaves the material dead hard. It is then reheated, or tempered to a blue color. Where there are large quantities of material to harden and temper, such as in watch factories the parts are placed in an iron box, heated to a specified degree as designated by the steel manufacturer. They are then plunged into water, which hardens them. The parts are then returned to a tempering oven, where the heat is brought up to specified requirements in order that the parts will be properly tempered for strength and

wearing qualities. The heat in this oven is controlled by a pyrometer.

Where an article is case hardened, it is made of machine steel that will not harden by heating and quenching in water. The article is heated to a red heat and pottasium cyanide in powdered form is applied to the surface of the article until it is well coated. The article is again brought to a red heat and quenched in cold water. This operation hardens the surface glass hard. Repeating this operation will harden the surface to a desired depth due to the carbon and pottasium cyanide being absorbed in the iron or soft steel producing a thin skinned steel, possibly .001 to .002 inches.

When larger pieces are to be case hardened, they are dipped into a pot of heated and melted pottasium cyanide and it often takes from six to twelve hours to produce a skin of steel sufficiently deep to give a wearing surface.

Jewelers Welcome Sensational New Buckle for Women's Bracelets

Highlighting the observance of its Twenty-Fifth Anniversary, Kestenman Bros., Mfg. Co. of Providence, R. I. is featuring a Lokfast Ratchet Buckle, with new Slide-Lock, for women's watch bracelets. This new buckle combines daintiness with extreme strength, simplicity and safety, and represents an important step forward in bracelet design. The manufacturer states the new buckle is being enthusiastically welcomed by jewelers from coast to coast.

Albuquerque Guild

Held election of officers at their regular meeting, May 20. Those elected are: G. W. Graham, President; E. M. Clic, Vice President; S. Bell, Secretary-treasurer.

Is any loupe but the best good enough to protect your eyes....and your living?

You use a loupe to get a larger, better view of your work. As a device producing an optical image, it is an optical instrument and must be finished to precision standards if it is to do its job adequately. For years American-made Bausch & Lomb loupes have been known for the fine precision of their manufacture. They are used by more watchmakers than all other makes combined. ***Ask your jobber.***

BAUSCH & LOMB OPTICAL CO.

443 BAUSCH ST. • ROCHESTER, N. Y.

Awards For Proficiency With WatchMaster

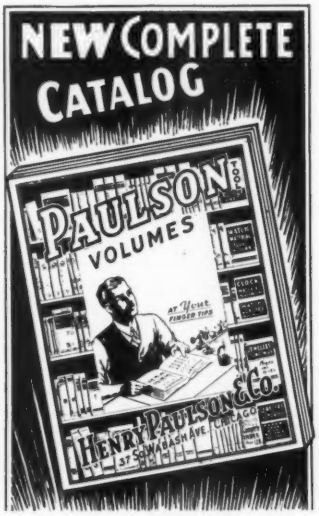
Who knows how to use the WATCHMASTER Watch Rate Recorder? Who knows how to analyze the charts of watch performance which it produces? Who is capable of interpreting these charts into terms of 'what must be done', and then when repairs are finished, who can produce charts on the machine that read acceptably?

American Time Products, Inc., distributors of the WATCHMASTER, have developed an interesting and effective plan whereby jewelers and watchmakers throughout the country can demonstrate their proficiency with the machine and receive recognition for their achievement.

The recognition is in the form of a certificate as shown, together with a gold and enamel insignia representing the WATCHMASTER figure, with a machine as his body and a watch as his head. A print of the insignia may be observed at the right of the seal on the illustration of the certificate.

To earn these awards, jewelers and watchmakers are required to complete tests of defective watches on the WATCHMASTER and to submit charts and written evidence of their proficiency with the machine. It should be noted that nothing is introduced to attest the watchmakers' ability at repair work, but is confined entirely to skill with the machine.

The interest and success of the plan were evident immediately after it was introduced in the MESSENGER, the house organ of American Time Products, Inc. From all parts of the country, jewelers and watchmakers have submitted the required tests to gain this coveted award. "Our plan", said Mr. Fetter, President of the company, "has met with an even greater enthusiasm than we anticipated."



Paulson issues new Watch Material, Tool, and Supply Catalog.

Volumes at your fingertips in this new issue.

The Paulson Company have a new arrangement for the accurate selection of Swiss watch material making this an easy operation for the watchmaker.

New tools, many of them exclusive with the Paulson Company are shown for the first time. This new catalog is sent free, postage paid to the trade.

Send your request to Henry Paulson Co., 37 S. Wabash Avenue, Chicago, Illinois.

THE JACQUES KREISLER MANUFACTURING CORPORATION announces the territorial changes of a number of their salesmen in the past few months, as well as the addition of a few newcomers. To the Kreisler fold has been admitted: PHILIP RIVKIN for INDIANA and MICHIGAN; BILL MILLER for PENNSYLVANIA, WEST VIRGINIA, and parts of OHIO and NEW YORK, who takes over the reins for MURRAY GREENBAUM, recently inducted into the army; HARRY HARNICK for LOUISIANA, OKLAHOMA, KANSAS, and TEXAS to supplant LEONARD LEES who moved on to another position; HERMAN FREUND to share GREATER NEW YORK and LONG ISLAND with SIDNEY KANE. With these additions, the Kreisler sales force is enlarged to 15 men covering the entire UNITED STATES—all carrying a complete line of watch attachments and ladies' and gentlemen's jewelry. The Company has full representation in the TERRITORY OF HAWAII.

The Kreisler men are now making their final rounds of a very successful Spring season. It is stated that many of them are far exceeding their quotas. This year the Company will award its leading salesman a ten-day trip to Bermuda as the first prize in a yearly merit contest.

Swartchild Issues Exclusive Watch Strap Catalog

Jewelers will be happy to receive a very useful as well as beautiful, new 28-page book—the TAND Watch Strap Catalog. To our knowledge, it is the only book of its kind ever issued, and will prove of considerable value both as a constant reference for keeping stock up to date and, because it contains Keystone prices and is beautifully illustrated, for showing to customers who want to identify some particular strap. Over a period of years, Swartchild & Co. has developed the Tand Watch Strap line until it now is the finest and most complete ever assembled. It comprises straps in every possible style, color and kind of leather in various qualities ranging from 50c to $2.00 at retail. The entire line is shown in the new Tand Catalog, a copy of which has been mailed to every jewelry store, with the compliments of Swartchild & Co., Chicago, New York, Dallas, Atlanta, Boston, and Buffalo.

New Improved Plastic Ring Stick

For years jewelers have been pulling an old metal ring stick out of a drawer to size rings. Now C. & E. Marshall Co. have created a new plastic ring stick that will flatter the most beautiful ring, in fact it is so attractive it can be used as a display stick also.

Jewelers will welcome it for its improved utility as well as its beauty. The stick is furnished in two color combinations; ivory marbleized plastic with black letters and graduations or black ebony plastic with silver letters and graduations. ALWAYS LEGIBLE because the numbers and graduations are on the stick permanently as they are burned in with the hot die and foil method (the same as hot stamping on leather). An innovation and added feature in plastic sticks is the groove to accomodate deep-set stones, for accuracy in gauging. Other added features are a metal ring for hanging and a hexagon handle to prevent rolling. Another Marshall Product conceived to give the jeweler the finest obtainable!

Kansas State Horological Association

The State Horologists and Jewelers met at Wichita, Kansas, Sunday, June 8th in joint session.

There were 247 registered.

Festivities really started the evening of June 7th with a lively stag party. Sunday was a busy day; business was short and snappy. Speakers were Frank Pfeiffer, President of the Kansas Retail Jewelers Association; Orville R. Hagans, National Secretary of U. H. A. A.; R. C. Hoppe, Research Engineer, Elgin. Meeting closed with a banquet and dance.

Officers elected are:

W. B. Brasfield Nat'l. Trustee

P. E. Loomis, re-elected President.

Clem Switlik, Vice President.

D. A. Wells, re-elected Secretary and also Treasurer.

W. B. Brasfield, National Trustee.

Monday program was addressed by Fred Sands, of Kansas City, Missouri, Gene Kiger of Kansas City, Missouri, Senator Henry J. Allen, Mr.

Reading left to right: W. B. Brasfield, State Trustee, P. E. Loomis Newton, State President; Orville R. Hagans, Colo. Nat'l. Exec. Secretary U.H.A.A., V. C. Meador, Hutchinson; Toastmaster, F. A. Pfeiffer, Parsons, Past President Jewelers Assn., R. C. Hoppe, Elgin Watch Co., D. A. Wells, Hutchinson, State Secretary.

W. J. Van Wormer of Wichita, Kansas, on salesmanship, closing with another banquet and entertainment. Jeweler officers elected:

Ray W. Gumm, President of Wichita, Kansas.

B. A. Strickler, Vice President of Salina, Kansas.

W. B. Brasfield, Secretary-Treasurer of Wichita, Kansas.

1942 Convention will be in Wichita, Kansas, earlier in the year.

Northwest Iowa Horological Guild

Held its June meeting the 17th.

Organized in February, 1939, this group of watchmakers from Fort Dodge and nearby towns formerly was known as the Northwest Iowa Horological Association.

At the June meeting, Mr. George Lundgren presented a technical discourse on the new Elinvar hairspring and balance wheel manufactured by the Hamilton Watch Company.

Members discussed the policy of charging a rental fee on the loan of watches while a person's watch is being repaired, although no definite action was taken at this meeting, the question to be brought up for further discussion later.

At the meetings of the local Guild, the time is spent in studying and discussing technical items and in comparing ideas and methods that will be of mutual benefit to members and will result in a higher standard of workmanship by which the public will benefit.

Dial Refinishing
Hairspring Vibrating
One Day Service
Our City Mail Service is Far Superior to Any Messenger Delivery. A Trial Will Convince You.
SANDSTEEL
CONCAVE — CONVEX
QUALITY
CROSSCURVED MAIN SPRINGS
Krieger & Dranoff
10 W. 47th St. New York City
Ask For Price List

Horological Association of Missouri

Held their Third Annual Convention at Sedalia, Missouri, June 15th and 16th. This being a joint convention with the Retail Jewelers Association of Missouri. This was the most successful convention ever held in Missouri with about 165 horologists from every part of the state participating. Ten resolutions were presented, seven of which were approved and adopted. Two of the approved resolutions, which were outstanding, are the second in which the Horological Association of Missouri recommends that they and the United Horological Association of America extend a leave of absence to every member in good standing who was compelled to serve his country through the selective service law, and that the United Horological Association continues sending the American Horologist to these men, without interruption, until they return. Resolution No. 3 was to recommend that the National Convention be held not later than May 15th.

It was also decided that the 1942 Convention be held on the fourth Sunday in April at Jefferson City, Missouri, and an invitation was extended the Missouri Retail Jewelers to hold a joint convention with that of the Missouri Horological Association at that time.

The officers elected are as follows:

President—Raymond C. Gable, St. Louis, Mo.

1st Vice President—Clemens Wolff, St. Louis, Mo.

2nd Vice President—James M. Dale, Albany, Mo.

3rd Vice President—Charles Percival, Thayer, Mo.

4th Vice Pres. — L. E. Kavanaugh, Springfield, Mo.

Secretary—Joseph E. Obmann, St. Louis, Mo.

Treasurer—Clinton Holt, Jefferson, Mo.

Board of Directors for 2 Years—W. R. Hastings, Joplin, Mo.

Board of Directors for 2 Years—Otto Falk, Bowling Green, Mo.

State officers reading left to right, J. E. Obmann, Secretary, St. Louis, Ray C. Gable, President, St. Louis, Clem Wolff, 1st Vice President, St. Louis, James Dale, 2nd Vice President, Albany, Charles Percival, 3rd Vice President, Thayer, L. E. Kavanaugh, 4th Vice President, Springfield, C. Holt, Treasurer, Jefferson City.

Life membership was extended to Mr. John Kruse of St. Louis, the state association's oldest member, who has retired.

The convention was concluded with a banquet and dance.

Missouri State meeting assembly, this was one of the largest groups ever assembled in Missouri during a State Convention.

SPECIAL NOTICES

Rates under all headings except "Situations Wanted," $1.50 for first 25 words, five cents for each additional word. "Situations Wanted," 75c for first 25 words, five cents for each additional word.

Advertisers who are not subscribers should send 25c for copy of magazine containing notice, if same is desired.

All "Special Notices" are payable in advance. Forms close on the 25th of the month.

FOR SALE

Will sell my store in Massachusetts to registered or qualified watchmaker, experienced to high class trade. Only store in town, terms may be arranged.
Box 507, The American Horologist.

Small Jewelry Store, Glendale, California. Owner in Poor Health. Write Box No. 506 American Horologist.

TOOLS FOR SALE

Velvo Clear Watch Cleaning Machine used. New and Used Lathes and Lathe Attachments. Back issues of Horology. R. P. (Dick) Gallien, 220 W. 5th St., Los Angeles.

WANTED TO PURCHASE

Cash for watchmakers and jewelers tools. Box 503, care of American Horologist, Denver, Colo.

WANTED

SHIPS CHRONOMETER, Give makers name and number, description of condition, price wanted. Chronometers repaired and refinished thruout.
P. O. Box 23, Halifax, Massachusetts.

REPAIR MEN WANTED

We have many attractive positions on our list for capable workmen of all types. Also have a long list of workmen wanting positions.

Our service is complimentary to both jewelers and workmen. Write us!
C. & E. Marshall Co., Box 7737, Chicago, Illinois.

POSITION WANTED

Fine watchmaker desires position with reliable firm. 29 years experience. Married, age 44. State reference and salary. West preferred. The American Horologist, Box 505.

MISCELLANEOUS

MODERN WATCHMAKING. Learn watchmaking the beter way. Save time, money. Complete Jewelry, Diamond Setting, Engraving courses. Easy terms. Write Kansas City School of Watchmaking, 113 E. 31, Kansas City, Missouri.

ADVERTISERS INDEX

Almo Sales Co. 33
Alpert Supply Co. 25
American Mainspring & Dial Service 15
American School of Aircraft Instruments 39
American Time Products, Inc. ..... Back Cover
Aristo Import Co. 23
Bausch & Lomb Optical Co. 45
Becker-Heckman Co. 34
Bowman Technical School 23
Bradley Polytechnic Institute 22
California Watch Case Co. 33
Chicago School of Aircraft Instruments 42
Cosley Jewelry Company 15
Dean Company 15
Elgin Watchmakers College 37
Federal Watch Crystal Company 22
Feurer Bros. 29
Friedman-Gessler Co. 11
Fulcrum Oil Co. 21
R. P. Gallien 37
Howard & Co., J. C. 23
Houston Mfg. Co. 8
Jadow, B. Inc. 2
Frank Kauffmann 25
K. C. School of Watchmaking 33
Kirk-Rich Dial Corp. 37
Krieger & Dranoff 48
Landaw Brothers 29
L. & R. Mfg. Co. 8
Louis Levin & Son 51
Martin Gluck & Son 34
C. & E. Marshall Co. ..... 26 & 27
McCaw, Wm. S. Company 23
Miller Dial & Name Plate Co. 31
Newall Mfg. Co. 13
New Haven 43
Wm. F. Nye, Inc. 35
Henry Paulson Co. 5
Fred Palm 17
Stanley Prokop 29
E. W. Reynolds Co. 7
Spartan School of Aeronautics 41
Swartchild & Company 3
Stanley Wenckus 22
Unusual Jewelry Supply Co. 17
Uptown Hairspring Service 15
Watch-Motor Mainspring Co. ..... Front Cover

3
5
5
9
r
3
5
4
3
2
3
2
5
5
7
2
9
1
1
7
3
8
2
5
3
7
8
9
8
1
4
7
3
3
5
. 5
17
29
. 7
41
. 3
22
17
15
ver

EXPERT MECHANICS IN DEMAND ! !

Improve your ability to do fine work. The defense program of the country requires skilled men for delicate work.

Practical Benchwork for Horologists

SUBJECTS TREATED ARE EXPLAINED IN SIMPLE LANGUAGE . . . .SUITABLE FOR HOME STUDY

The Most Authoritative Work on

Tools and Their Uses.
Repair Problems
Adjusting
Watch Rate Recorder
Watch Performance
Mechanical Drawing
Lever Escapement and Many Other Subjects

The best illustrated book ever published for the man at the bench.

$5.00

346 pages, 438 illustrations.....Price prepaid

ACCLAIMED BY LEADING HOROLOGISTS EVERYWHERE

Order from your watch material dealer or from

Louis Levin & Son

747 S. Hill Street **Los Angeles, California**

BULOVA revamps timing systems with Watch Master Recorders

Eighteen WatchMasters operating from a central frequency standard at Woodside, L. I. Other multiple installations have been made by Bulova at Waltham, Mass., and New York. Nearly every prominent watch manufacturer in the country use WatchMasters.

For your greater efficiency and profit, take a tip from the large Watch Companies

Locating watch troubles and bringing watches to time are details in which inefficiency can mount into vast losses of time and money.

Take a tip from those who have tested and compared. Jewelers from coast to coast say that the WatchMaster quickly pays for itself on watch repair work and in testing new watches for stock.

Ask for a copy of our "Two-way Profit Plan" booklet.

American Time Products, Inc.

580 FIFTH AVENUE NEW YORK, N. Y.

Distributors of Western-Electric Watch-rate Recorders